# ENGINEERING AND MINING JOURNAL

A McGRAW-HILL PUBLICATION

AUGUST 1952

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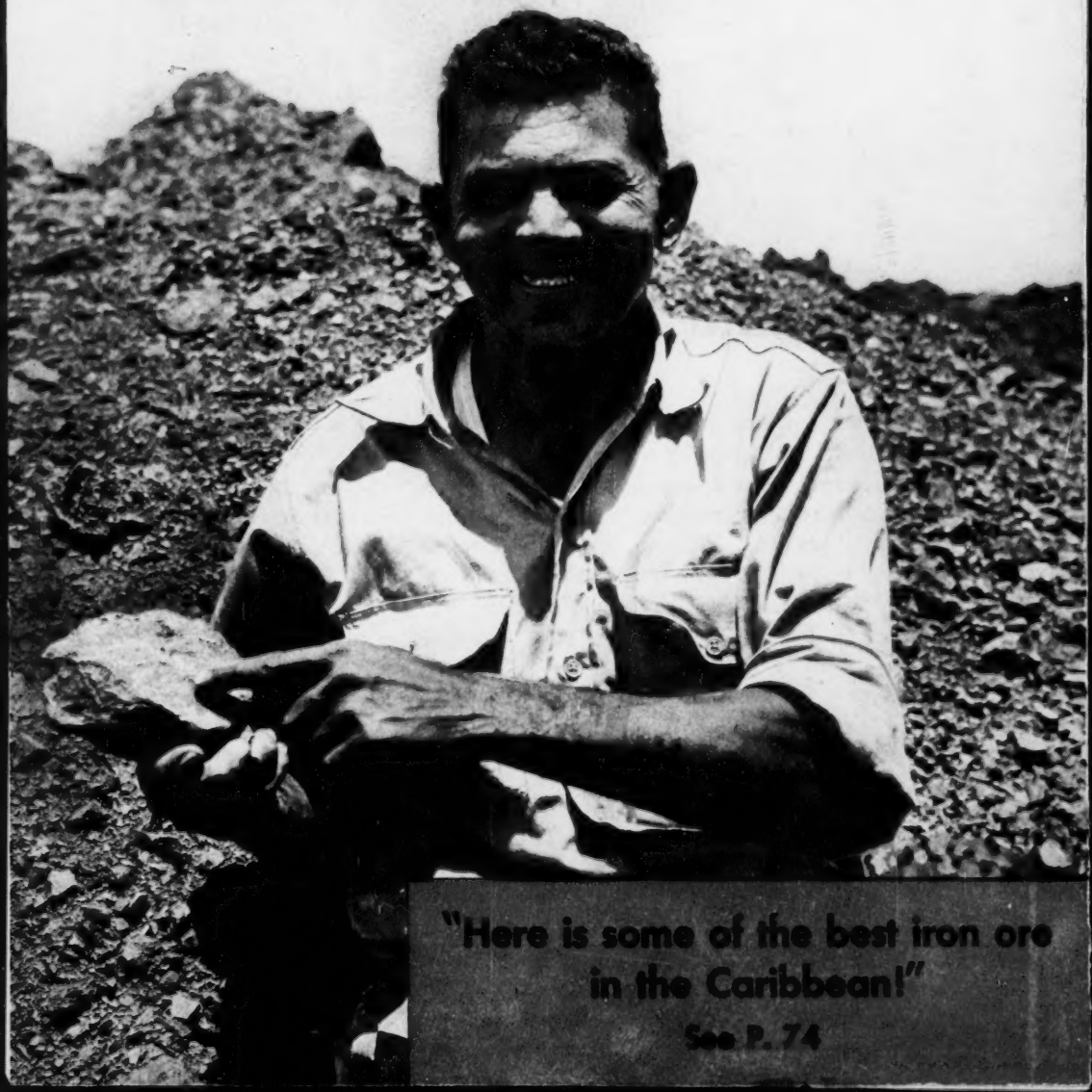
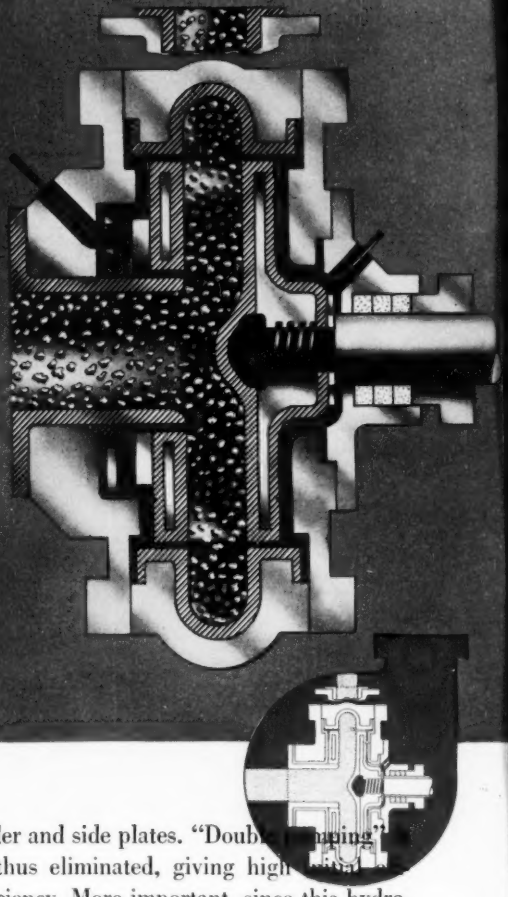


"Here is some of the best iron ore in the Caribbean!"

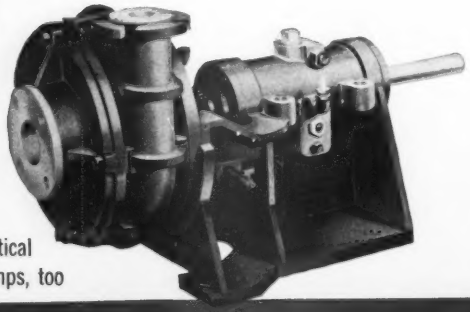
See P. 74

See our Exhibit—Booth 724
MINING SHOW
Denver—Sept. 22-25

# Abrasives out!



**Abrasives** are kept from making trouble in Hydroseal Pumps by a small amount of clear water that flows in the direction shown by the arrows. At a pressure slightly above pump discharge, this sealing water prevents abrasives from entering the clearances between the impeller and side plates. "Double [illegible]ping" is thus eliminated, giving high [illegible] efficiency. More important, since this hydrosealing protects close clearances from wear, these pumps maintain their high efficiency for life. As a result, power savings alone generally pay for Hydroseals in a short period of time.



Vertical pumps, too

**If you have a decision to make on sand, slurry, or dredge pumps, get the Hydroseal facts before you make up your mind. Write for Catalog No. 552.**

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**Dept. B—259 E. Lancaster Ave., Wynnewood, Pa.**
*Representatives in Most Principal Cities*

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SAND, SLURRY & DREDGE PUMPS
MAXIMIX RUBBER PROTECTED

HYDROSEAL, PACKLESS AND MAXIMIX DESIGNS ARE COVERED BY PATENTS AND APPLICATIONS IN THE MAJOR MINING CENTERS OF THE WORLD

HOW TO GRIND CARSET JACKBITS
WHEEL RECOMMENDATIONS
Ingersoll-Rand
IMPORTANT THINGS TO WATCH
When Threading Ingersoll-Rand 100 Series Jackrods
TO MAKE GOOD RODS GAUGES MUST BE USED
SOME HELPFUL DON'TS
Ingersoll-Rand
HOW TO GET THE MOST OUT OF YOUR CARSET JACKBITS
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** To get maximum drilling speed and longest bit life you should use Ingersoll-Rand Carset Jackbits as indicated on these charts.*

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**Please send me, free of charge, the wall charts checked below:**

- ☐ Grinding Carset Jackbits, Form 4121
- ☐ Using Carset Jackbits, Form 4122
- ☐ Threading Jackrods, Form 4112
- ☐ Rolling the Undercut, Form 4120

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Company_____
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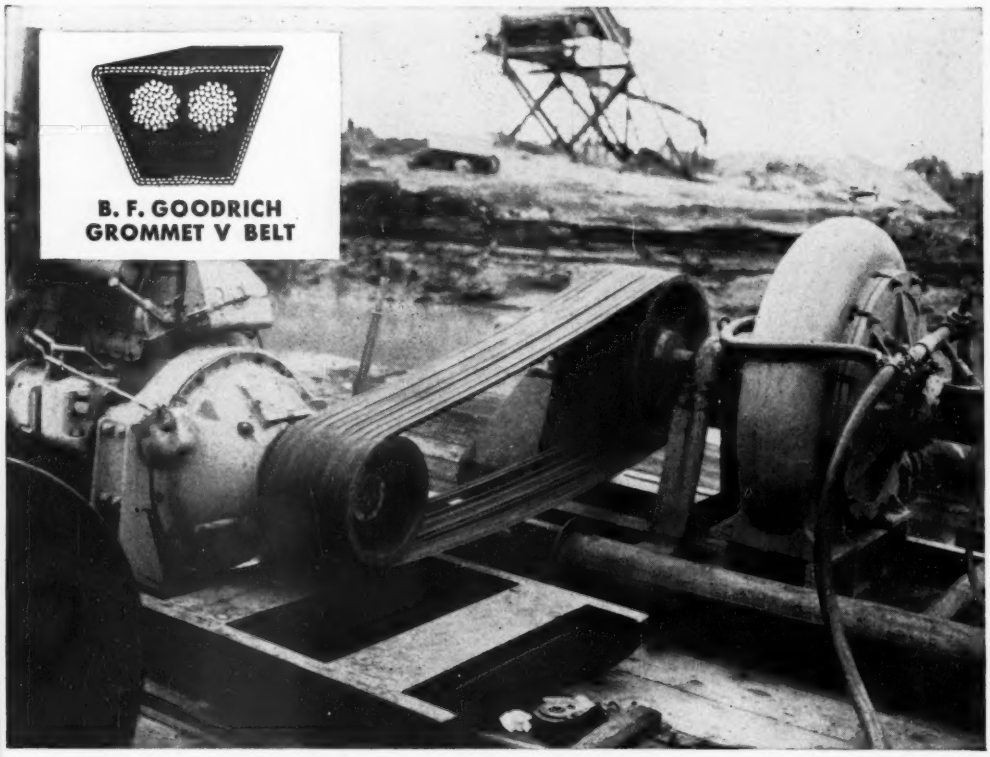
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER




# Where B. F. Goodrich grommet belts are outlasting others 2 to 1

## *B. F. Goodrich grommet V belts cut costs 20 to 50%*

THOSE nine belts run a sand pump 10 hours a day, 6 days a week. Ordinary V belts had to be stretched extra tight in order to run the heavy pump. In addition to causing bearing wear, the tight fit pressed sand into belts and pulley, resulting in serious wear on both. When B. F. Goodrich grommet V belts were installed, it was found they gave good gripping action, even though not tightened. With belts running at less tension, abrasive wear was cut way down, belt and pulley life doubled, and heavy bearing wear in the motor eliminated. Here's the reason B. F. Goodrich grommet V belts outperform ordinary belts:

*No cord ends* — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

*Concentrated cord strength* — All of the cord material in a B. F. Goodrich grommet multiple-V belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced.

*Better grip, less slip* — Because a grommet is endless, a grommet V belt is more flexible, grips the pulleys better. Size for size, grommet multiple-V belts will give ⅓ more gripping power, pull heavier loads with a higher safety factor.

*Only B. F. Goodrich has the grommet!*—No other multiple-V belt is a grommet V belt (U. S. Patent No. 2,233,294). Now available in C, D and E sections. See your local B. F. Goodrich distributor. *The B. F. Goodrich Company, Industrial & General Products Division, Akron, Ohio* (available in Canada).

*Grommet V Belts* BY
**B.F.Goodrich**
**RUBBER FOR INDUSTRY**

# ENGINEERING AND MINING JOURNAL

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Published monthly by McGraw-Hill Publishing Co., Inc. James H. McGraw (1860-1948), Founder. Publication Office, 1309 Noble St., Philadelphia 23, Pa. Executive, Editorial and Advertising Offices: McGraw-Hill Building, 330 West 42nd St., New York 36, N. Y. Curtis W. McGraw, President; Willard Chevalier, Executive Vice President; Joseph A. Gerardi, Vice President and Treasurer; John J. Cooke, Secretary; Paul Montgomery, Senior Vice President, Publications Division; Ralph B. Smith, Editorial Director; Nelson Bond, Vice President and Director of Advertising; J. E. Blackburn, Jr., Vice President and Director of Circulation.

Subscriptions: Address correspondence to Engineering and Mining Journal—Subscription Service, 1309 Noble St., Philadelphia 23, Pa., or 330 West 42nd St., New York 36, N. Y. Allow one month for change of address.

Subscriptions are solicited only from management, production, and maintenance executives and engineers in the metal and nonmetallic mining and refining industry. Position and company connection must be indicated on subscription orders.

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Branch Offices: San Francisco 4, 68 Post St.; Chicago 11, 520 N. Michigan Ave.; Los Angeles 17, 1111 Wilshire Blvd.; Washington, D.C., National Press Bldg.; Pittsburgh 22, 719 Oliver Bldg.; Detroit 26, 856 Penobscot Bldg.; Cleveland 15, 1510 Hanna Bldg.; Boston 16, 350 Park Square Bldg.; Philadelphia 3, 17th and Sansom Sts.; Atlanta 3, 1231 Rhodes-Haverty Bldg.; St. Louis 8, Continental Bldg. District Managers: New York, T. R. Aleen; New York and New England, S. Kennedy; Philadelphia, W. A. Potter; Cleveland, W. M. Spears; Pittsburgh, H. C. Chellson; Chicago, C. J. Coash; San Francisco, J. W. Otterson; Atlanta, R. O. Maultsby; Los Angeles, C. W. Dysinger; St. Louis, F. W. Roets; London Address: McGraw-Hill Publishing Co., Ltd., McGraw-Hill House, 95 Farringdon Street, London E.C. 4, England. Cable address: McGraw-Hill, London. Other McGraw-Hill foreign news offices in Paris, Berlin, Moscow, Prague, Shanghai and Mexico City.

Price of this issue 50c. Subscription rates: United States and possessions, $3 a year, $4 for 2 years, $5 for 3 years. Other Western Hemisphere, $5 a year, $8 for 2 years, $10 for 3 years. Elsewhere $15 a year, $25 for 2 years, $30 for 3 years. Please indicate position and company connection in all subscription orders.

Entered as second class matter May 24, 1951, at the Post Office at Philadelphia, Pa. under the Act of March 3, 1879. Copyright 1952 by McGraw-Hill Publishing Co., Inc.—All Rights Reserved. Printed in U.S.A.

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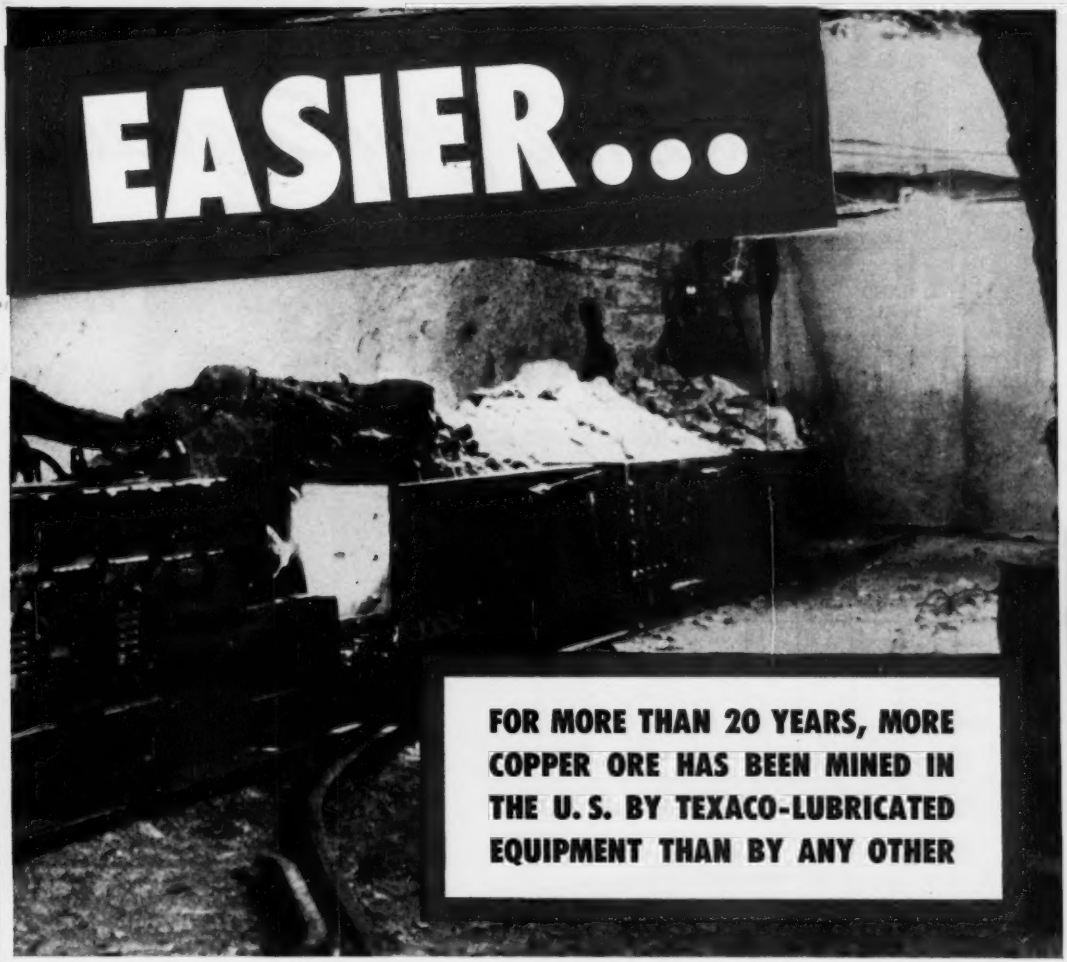
*Texaco Olympian Grease* tops other greases in resistance to oxidation, freedom from separation,

TEXACO

TEXACO




both in use and in storage, ability to *stay in* the bearings and effectively seal against dirt and moisture. *Texaco Olympian Grease* is an all-year lubricant, requires no seasonal change. Available in three consistencies to meet all requirements of plain, cavity hub or anti-friction bearings.

To keep wire rope strong longer, use *Texaco Crater A*. It lubricates the strands and protects the core whether cable is wet or dry. On open gears, use *Texaco Crater X Fluid*. It goes on as a liquid, *stays* on as a tough, cushioning film that prolongs gear life.

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**Lubricants and Fuels**
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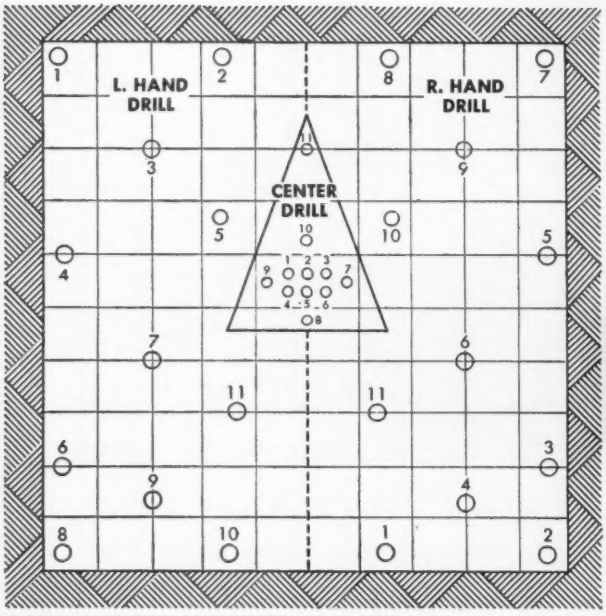
*Faithfully yours* 50 TEXACO *for Fifty Years*

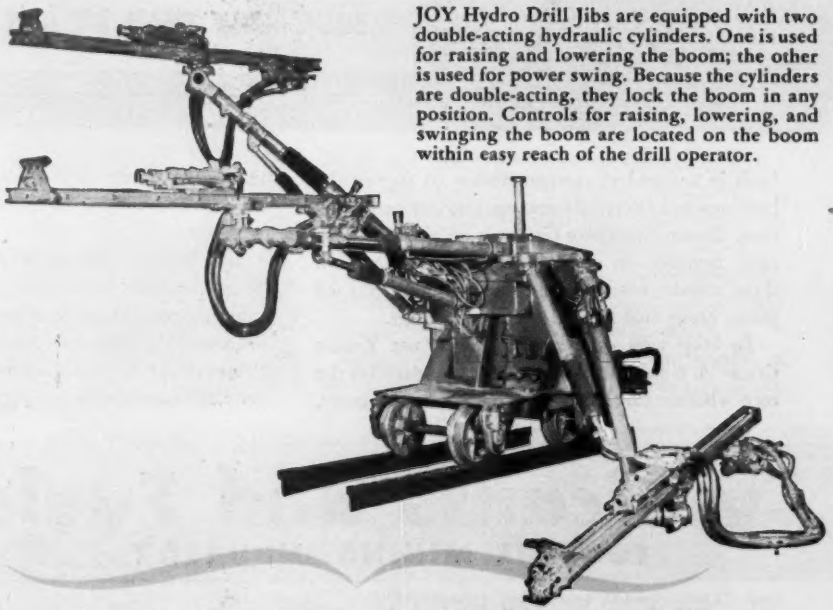
# "DRILL OUT THIS ROUND"

## *said the Joy Engineer . . .*



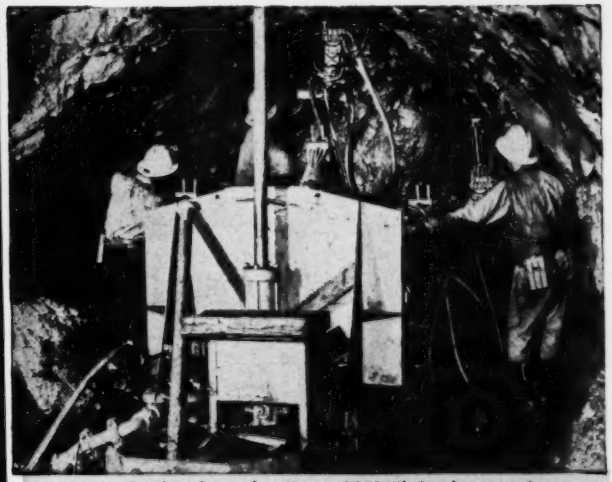
JOY Hydro Drill Jibs are equipped with two double-acting hydraulic cylinders. One is used for raising and lowering the boom; the other is used for power swing. Because the cylinders are double-acting, they lock the boom in any position. Controls for raising, lowering, and swinging the boom are located on the boom within easy reach of the drill operator.

**MAXIMUM VERTICAL RANGE WITH VARIOUS LENGTH BOOMS: 10 to 14 FEET**

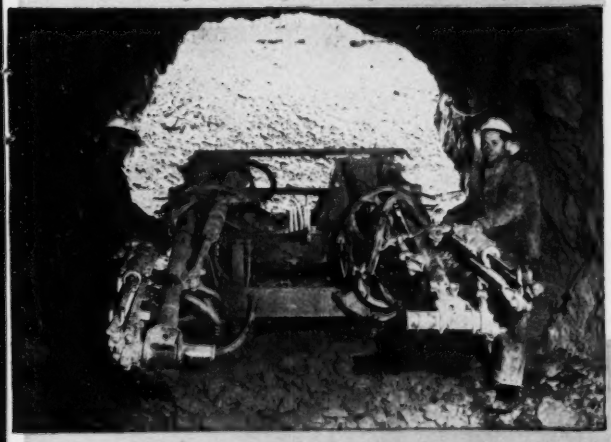


**MAXIMUM LATERAL RANGE WITH VARIOUS LENGTH BOOMS: 18 to 28 FEET**

# . . . "IN RECORD TIME and WITH LESS EFFORT with JOY HYDRO DRILL JIBS"



*On the job in a heading: a JOY Jib Jumbo mounting three Hydro Drill Jibs with JOY T-300 drifters.*



*JOY builds a complete line of Jib Jumbos and Drill-mobiles. Above: a twin-boom JOY Drillmobile, rubber-tired and self-propelled for quick, easy mobility.*

The recommendation above was made by one of Joy's drill mechanization specialists. He made it to a mining company which is now a satisfied user of the equipment recommended: four Joy Jib Jumbos (see facing page) each mounting three Joy T-300 Drifters on LW-6A long chain feeds. He went on to say—

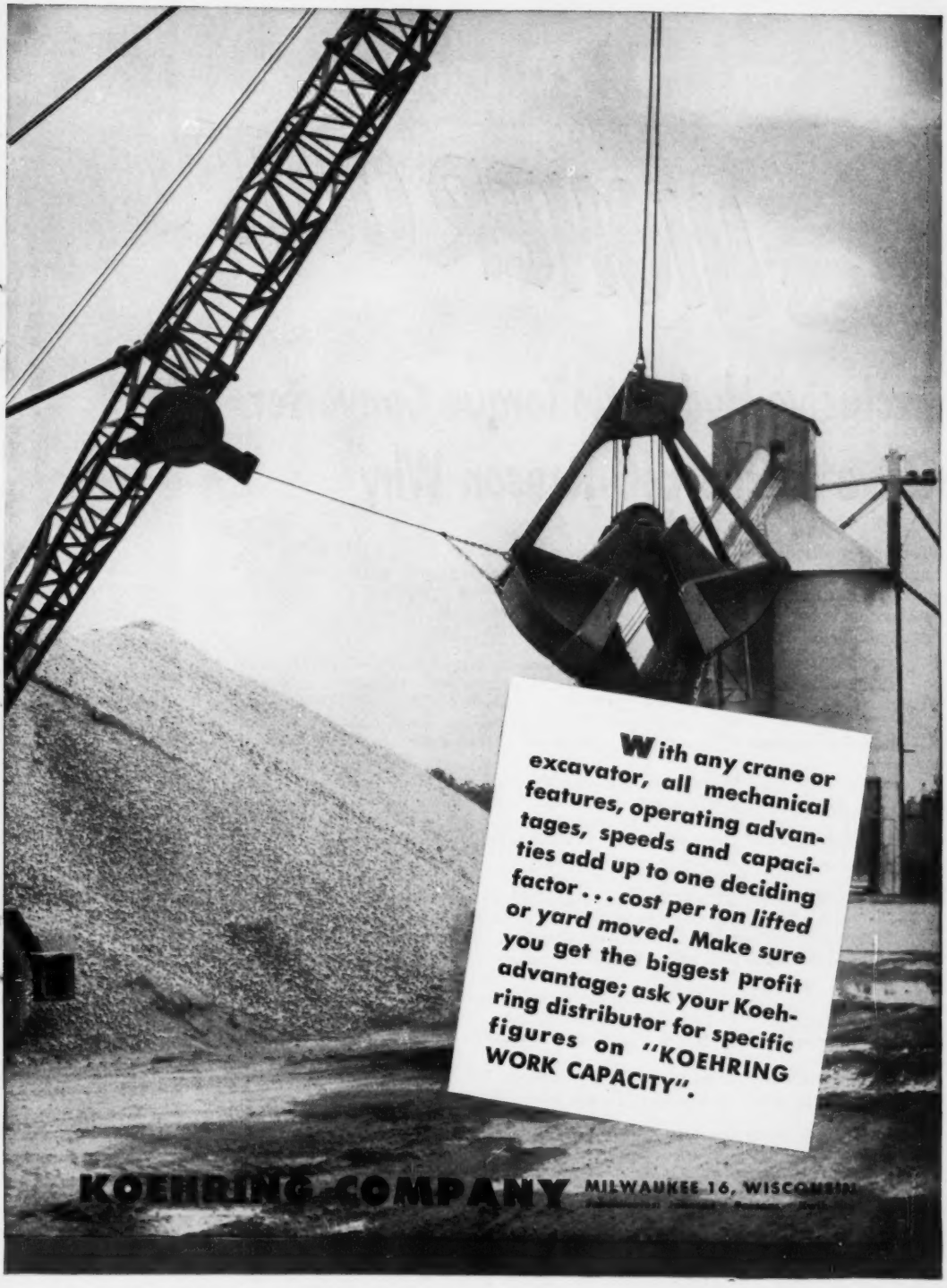
*"The LW 6A feed, easily supported by the Hydro Drill Jib, has an overall travel of 8 feet with a steel change of 6 feet. Thus, the proposed round can be drilled with one length of steel."*

He then proposed and fully explained a drilling pattern (again see facing page) for a 10′ x 10′ round, showing the location of the eleven holes to be drilled by each one of the three jib-mounted drills. Basically, the plan provided for the least interference, and the maximum amount of drilling without dumping or swinging the drills. The holes for each drill were numbered so that the spreads between gave the runners plenty of working room. He closed by saying—

*"The purpose of this proposal is to describe the many advantages of Joy fully automatic Hydro Drill Jibs. Joy pioneered the hydraulic drill jib and is still maintaining the lead in the design of this type of rig. We are keeping ahead with sound, practical improvements, and today believe we produce the finest drilling equipment available."*

● Why not let a Joy drill mechanization specialist look over your problem and solve it the way he did this one? *Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa. In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

You owe it to yourself to check...
"KOEHRING WORK CAPACITY"
KOEHRING
KOEHRING HEAVY DUTY


With any crane or excavator, all mechanical features, operating advantages, speeds and capacities add up to one deciding factor . . . cost per ton lifted or yard moved. Make sure you get the biggest profit advantage; ask your Koehring distributor for specific figures on "KOEHRING WORK CAPACITY".
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# gives HIGHER OUTPUT—

## Exclusive Hydraulic Torque Converter Drive Is One BIG Reason Why

The hydraulic torque converter drive, *exclusive* in the Allis-Chalmers HD-20 Tractor, brings you productivity, handling ease and dependability that makes every hour, every day of the season count . . . gives the operator the equivalent of hundreds of gear ratios in two speed ranges . . . automatically selects the proper speed for maximum production.

*Dozing*

With hydraulic torque converter drive you take full advantage of available horsepower . . . roll bigger loads, tackle tougher dozing jobs. Master clutch engages under cushioned protection, yet power is achieved *instantly* with velvet-like smoothness. This means fewer repairs . . . longer life of tractor and auxiliary equipment.

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There's nothing like the HD-20 for sheer productive power. Torque converter actually multiplies torque up to four and one-half times . . . develops tremendous drawbar pull to start the load smoothly, and automatically accelerates to highest speed conditions permit, in either high or low range.

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*Pushing*

The HD-20 makes smoother contact, automatically matches speed to pushed equipment, maintains steady contact while loading, sends load off to the fill in a higher speed.

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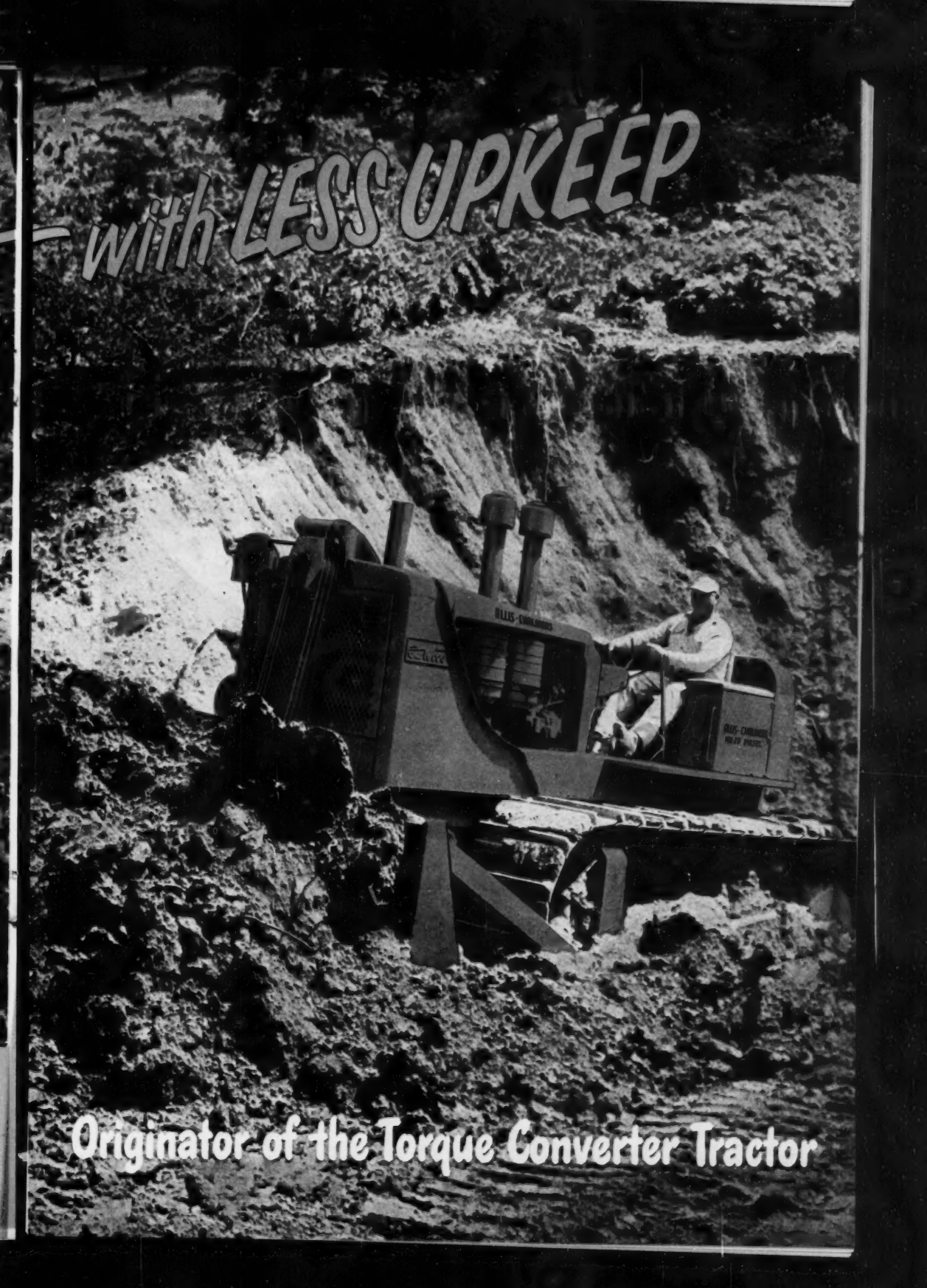
**Weight: 41,000 lb.**
**175 Net hp.**
**at flywheel**


— with LESS UPKEEP
Originator of the Torque Converter Tractor

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MAINTENANCE COSTS ARE LOW for users of Allis-Chalmers Totally-Enclosed, Fan-Cooled Motors. They are easy to clean because even the stickiest dirt can be wiped or blown off without dismantling the motor or even stopping it. They seldom require cleaning because cooling air flows over the *outside* of the motor. There are no external concealed air passages to clog up and cause over-heating. You get better operational continuity, lower maintenance.

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A-3639

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These fast 2½ yd. machines have proved themselves on the wide variety of work that the Range demands. Whether you are starting a new mine or modernizing an old one you should know Northwest advantages for mining conditions.

The Northwest Dual Independent Crowd utilizes force most other independent crowd shovels waste, giving greater output. The "Feather-Touch" Clutch Control gives ease of operation with a simple mechanical device free from pumps, compressors or valves. No special adjustments are required. Fast swing and accurate spotting are assured by Uniform Pressure Swing Clutches that eliminate the jerks and grabs and overswinging of the ordinary hand clutch. Positive traction on *both* crawlers while turning as well as when going straight ahead take your machine through the difficult spots that delay other rigs.

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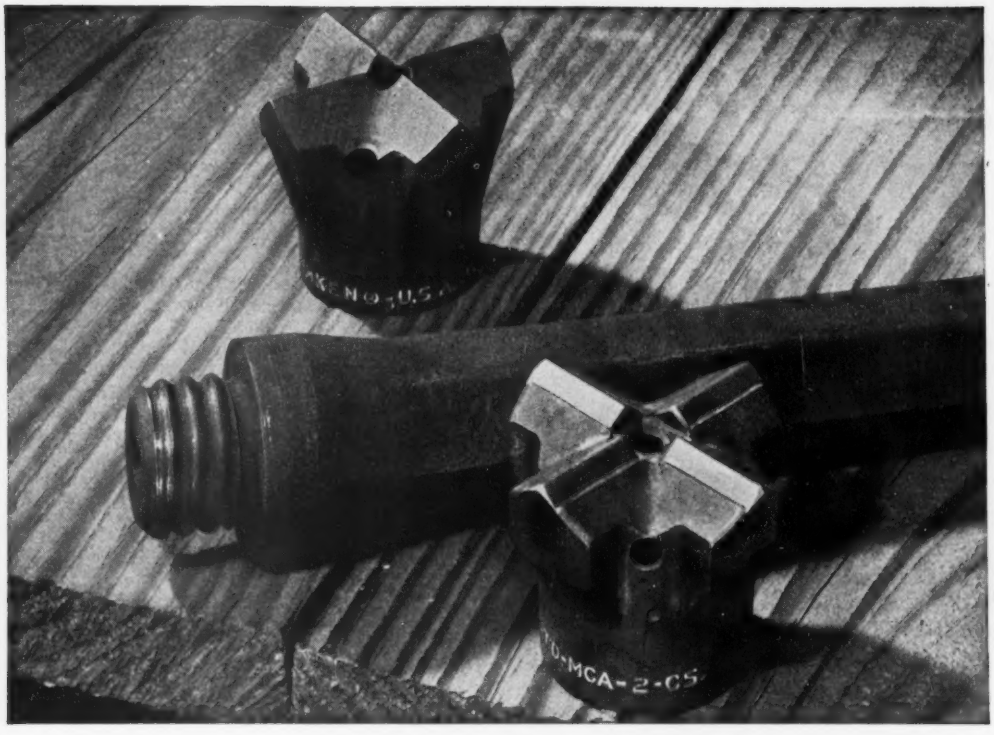

# Drill steels do double duty with TIMKEN® interchangeable rock bits!

ONE drill steel can do the work of two when you use Timken® interchangeable rock bits. That's because both Timken multi-use and Timken carbide insert bits fit the same threaded steel. You can change them as the ground changes—right on the job!

For ordinary ground, use Timken multi-use bits. Correctly controlled and reconditioned, they'll give you the lowest cost per foot of hole when full increments of steel can be drilled.

Make a quick switch to Timken carbide insert bits when you hit hard, abrasive ground. They're your best bet for maximum speed drilling, small diameter blast holes, very deep holes and constant gauge holes.

With both of these Timken bits on the job you'll have the answer to every drilling problem.

Both Timken multi-use and Timken carbide insert bits are interchangeable in each thread series. And each type has these three inportant advantages: (1) made from electric furnace Timken fine alloy steel, (2) threads are not subject to drilling impact because of the special shoulder union developed by the Timken Company, (3) quickly and easily changed.

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Timken threaded multi-use rock bit

Timken threaded carbide insert rock bit

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***for example:***

***8-10'x10' MARCYS – 5th repeat order from large Arizona copper producer.***

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Illustrating shield partly expanded, after insertion in hole.

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Bethlehem offers two types of roof bolts to mine operators. Each bolt comes in a variety of lengths, and can be used vertically or at an angle. Write for full particulars.

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(WITH EXPANSION SHIELD)

An assembly, consisting of unchamfered square-head rolled-thread ¾-in. bolt, plug, and expansion shield. Pressed ears on bolt shank support shield during anchoring. Plug is forced into shield when bolt is tightened, expanding the shield to provide holding-tension. Projections on leaves of shield contact sides of hole, prevent shield from turning when bolt is rotated.

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BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

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# *Tough* answer to a *Tough* problem

## A SUPER-BRIGHT RED COVER AIR HOSE

EVEN in the most rugged hose service — direct connection to compressors in mines, quarries and construction operations — you can depend on REDWING-H Cord Air Hose for longest, trouble-free service.

That's because this hose was developed by the G.T.M. — Goodyear Technical Man — to take hard knocks in stride. Everything from its oil-resistant tube to the red cover of tough, resilient stock adds up to long life at lowest over-all cost.

Ask the G.T.M. about REDWING-H Cord Air Hose for your tough jobs. Or see your nearest Goodyear Industrial Rubber Products Distributor. Available in continuous lengths, for working pressures from 200 to 350 lbs. psi maximum; sizes from ½" to 1½" I.D.

GOODYEAR INDUSTRIAL RUBBER PRODUCTS
GTM-Specified
REDWING-H CORD AIR HOSE
A
B
C
A — synthetic tube is seamless, nonporous, non-flaking, oil-resistant
B — two or three braids of high-strength rayon reinforce against shock blows
C — red cover of heavy, resilient stock bounces away abrasion, cuts, gouges

**LOOK FOR YOUR GOODYEAR INDUSTRIAL RUBBER PRODUCTS DISTRIBUTOR** *in the yellow pages of your Telephone Directory under "Rubber Products" or "Rubber Goods." He handles Hose, Flat Belts, V-Belts, Molded Goods, Packing, Tank Lining, Rubber-Covered Rolls built to the world's highest standard of quality.*

# GOODYEAR

## THE GREATEST NAME IN RUBBER

Redwing—T. M. The Goodyear Tire & Rubber Company, Akron, Ohio

FULLY MECHANIZED LOADING in the Netta Mine as an HT4 Traxcavator Shovel on a "Caterpillar" D4 Tractor shovels ore into a W10 Wagon pulled by a "Cat" DW10 Tractor.

SMOOTH, FIRM HAUL ROADS are kept in top condition in the Netta Mine by a "Caterpillar" No. 11 Motor Grader. In this lead mine, the Eagle-Picher Co. has 18 miles of haul road.

# How to Mechanize a Lead-zinc Mine

After World War II, Eagle-Picher Co., which operates 17 lead-zinc mines in the Tri-State Area, began a full-blown mechanization program. "Caterpillar" equipment played an important role.

### Mine Data:

88 miles of underground roads. Veins run 18 to 132 feet thick. Mines are room-and-pillar construction with 40-50 foot pillars spaced 50-100 feet apart. Ore, assaying about 3%, loosened by drilling and blasting.

### Problem:

Get the ore to the surface quickly, economically, dependably.

### Solution:

"Caterpillar" Motor Graders, Tractors, Wagons, 'Dozers, and Traxcavator Shovels, all equipped with air scrubbers for exhaust. Equipment disassembled at surface, lowered, and reassembled.

### West Side Mines #1 and #2

"Cat" No. 11 Motor Grader keeps 15 miles of haul road smooth and firm, 404 feet underground, for trucks transporting ore. "Caterpillar" Diesel D4 Tractor with HT4 Traxcavator Shovel loads 1½ tons per bite, ore weighing 100 pounds per cubic foot. Trucks carry ore to hopper near skip hoist, which brings ore to surface and into another hopper. Rail cars are loaded from surface hopper at an average of 784 tons per day.

### Netta Mine:

The 18 miles of road in this mine, also near Cardin, Oklahoma, are rougher. They can be because the haul is made by a fast "Cat" DW10 Tractor pulling a W10 Wagon. "Caterpillar" D4 Tractor with HT4 Traxcavator Shovel loads 131 tons per shift. Big yellow team makes 3 round trips an hour over 3½-mile haul distance with average load of 15 tons. Wagon loads hoppers, which load 1-ton "cans" for elevation to surface.

Your "Caterpillar" Dealer has a wide selection of equipment engineered to increase your mine production. Rugged, dependable "Caterpillar" equipment means speed; speed means money.

**CATERPILLAR TRACTOR CO., PEORIA, ILLINOIS**

# Count on MANCHA'S LITTLE TRAMMER

(STORAGE BATTERY LOCOMOTIVE)

## to do a big job — production-wise and profit-wise

Whatever the work at hand — haulage, moving mucking machines, drill jumbos, timber, powder, supplies, or man trips to distant workings — you can count on a Mancha Little Trammer to do the job dependably, quickly, and economically.

Small enough for work in narrow, crooked drifts, and powered by a rugged, heavy duty motor, the Little Trammer stands up under severe operating conditions — does a whale of a job, with complete safety for the motorman, and with minimum expense for operation and maintenance.

OPERATING WT., 1½ TONS
The hinged cab of the Little Trammer raises to shorten cag-ing length, to facilitate transfer from level to level even in small mines.

## Mancha's Little Trammers

are doing a big job for mining companies all over the world

### Will Mancha's Little Trammer pay in your mine?

You can find out quickly and easily. Just mail the coupon for our "mine haulage data form." The information you provide will be analyzed by Mancha Engineers, who will then tell you what economies you can effect with the use of this storage battery locomotive. Mail the coupon today. There's no obligation.

Mancha Storage Battery Locomotive
Division GOODMAN Manufacturing Company
4850 South Halsted Street, Chicago 9, Ill., U.S.A.
E AND MJ 882
Send your mine haulage data form.

NAME _____

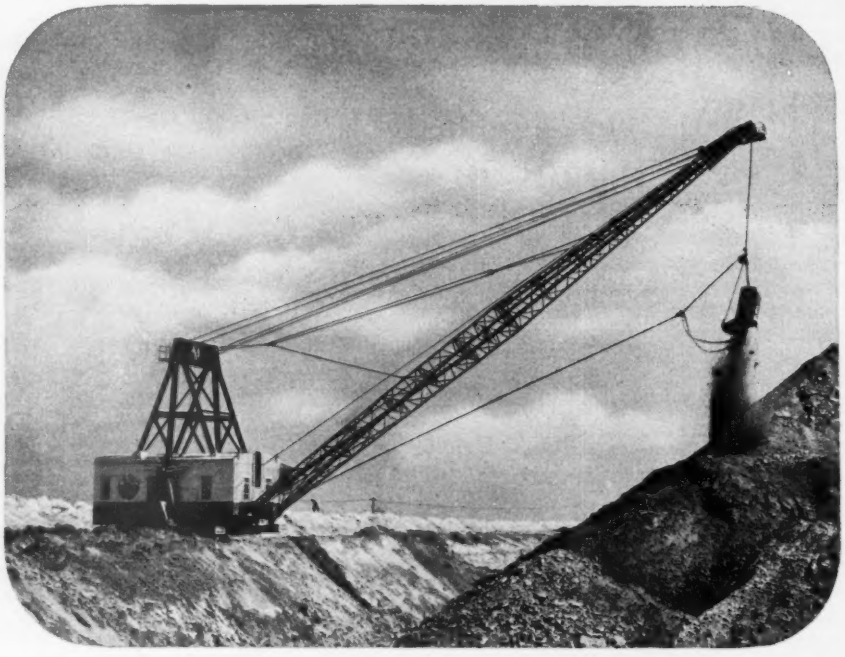
FIRM _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

MANCHA STORAGE BATTERY LOCOMOTIVE
Division GOODMAN Manufacturing Company
4850 SOUTH HALSTED STREET CHICAGO 9, ILL., U.S.A.

# WIRE ROPE



## *This is the most economical rope we've ever made for mining*

ROEBLING is the best known name in wire rope. That's partly because we were the first wire rope maker in America. But more than that, we've always led in developing better wire and better rope for every purpose.

Today's Roebling Preformed "Blue Center" Steel Wire Rope is the miners' best choice for efficiency and long life. This rope has extra resistance to crushing and abrasion . . . takes rough going. It saves you time and cuts costs.

There's a Roebling wire rope for top service on any job. Call on your Roebling Field Man for his recommendations. John A. Roebling's Sons Company, Trenton 2, New Jersey.

**ROEBLING**

ATLANTA, 934 AVON AVE • BOSTON, 51 SLEEPER ST • CHICAGO, 5525 W. ROOSEVELT RD • CINCINNATI, 3253 FREDONIA AVE • CLEVELAND, 701 ST. CLAIR AVE, N. E. • DENVER, 4801 JACKSON ST • DETROIT, 915 FISHER BLDG • HOUSTON, 6216 NAVIGATION BLVD • LOS ANGELES, 5340 HARBOR ST • NEW YORK, 19 RECTOR ST • ODESSA, TEXAS, 1920 E. 2ND ST • PHILADELPHIA, 230 VINE ST • SAN FRANCISCO, 1740 17TH ST • SEATTLE, 900 1ST AVE S. • TULSA, 221 N. CHEYENNE ST • EXPORT SALES OFFICE, TRENTON 2, N. J.

Ready Anytime
Eimco Loaders are ready to go to work anytime of the day or night. These heavy-duty units are built of strong alloy-steel castings, which are carefully machined and assembled. They are built to stay on the job, no matter how difficult or long it may be.
Write for information on jobs Eimco has done which may be similar to yours.
EIMCO
A186
THE EIMCO CORPORATION
The World's Largest Manufacturers of Underground Rock Loading Machines
EXECUTIVE OFFICES AND FACTORIES - SALT LAKE CITY 10 UTAH U. S. A.
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AND BRANCHES. SOCIETE EIMCO, PARIS, FRANCE
EIMCO (GREAT BRITAIN) LTD. LEEDS 11, ENGLAND
AGENTS IN ALL PRINCIPAL CITIES THROUGHOUT THE WORLD

# Why BUCYRUS-ERIE DRILLS NEED LESS MAINTENANCE ATTENTION

Bucyrus-Erie Blast Hole Drills keep pounding out footage, in large volume, day after day, with just the barest minimum of maintenance attention — and cost. Here are some specific reasons why:

## LESS VIBRATION

Equipped with rubber shock absorber in the derrick head, rubber insulated heel and spudding beam sheaves, rubber insulated tool guide, Bucyrus-Erie drills are fully protected against shock and vibration. And operation is particularly smooth because ball and roller bearings are freely used.

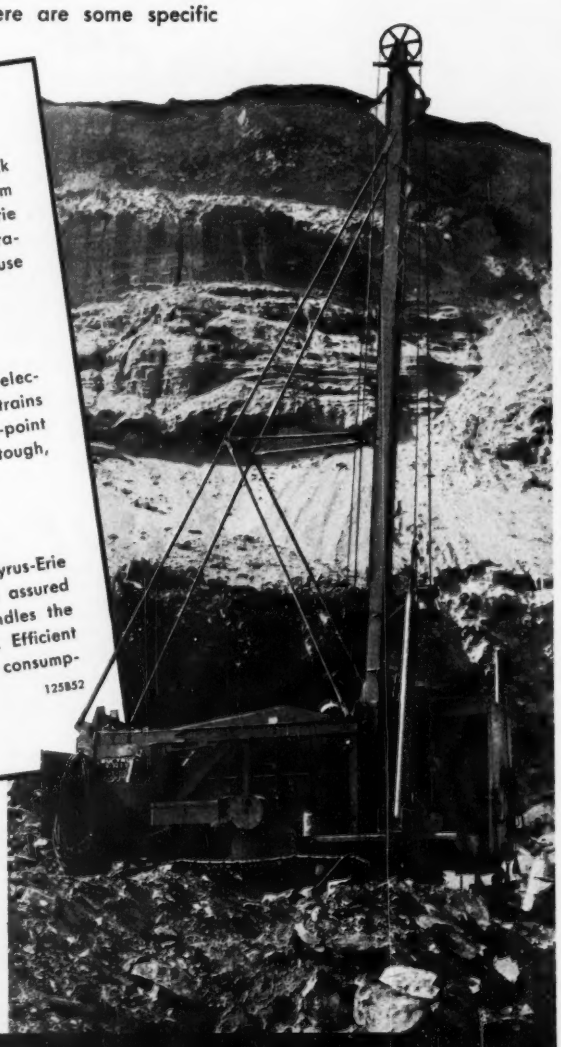
## EXTRA STRENGTH

Bucyrus-Erie drill frames and derricks are electrically welded and rigidly braced to resist strains and stresses. Derrick is held in place by 8-point cantilever bracing. Drill machinery is big, tough, simple — easy to get at, easy to adjust.

## AMPLE POWER

Whatever power you select for your Bucyrus-Erie drill — gasoline, electric, diesel — you are assured of a big, heavy-duty unit that easily handles the heaviest tool strings in the drill's size range. Efficient application of power keeps fuel or current consumption low.

125852



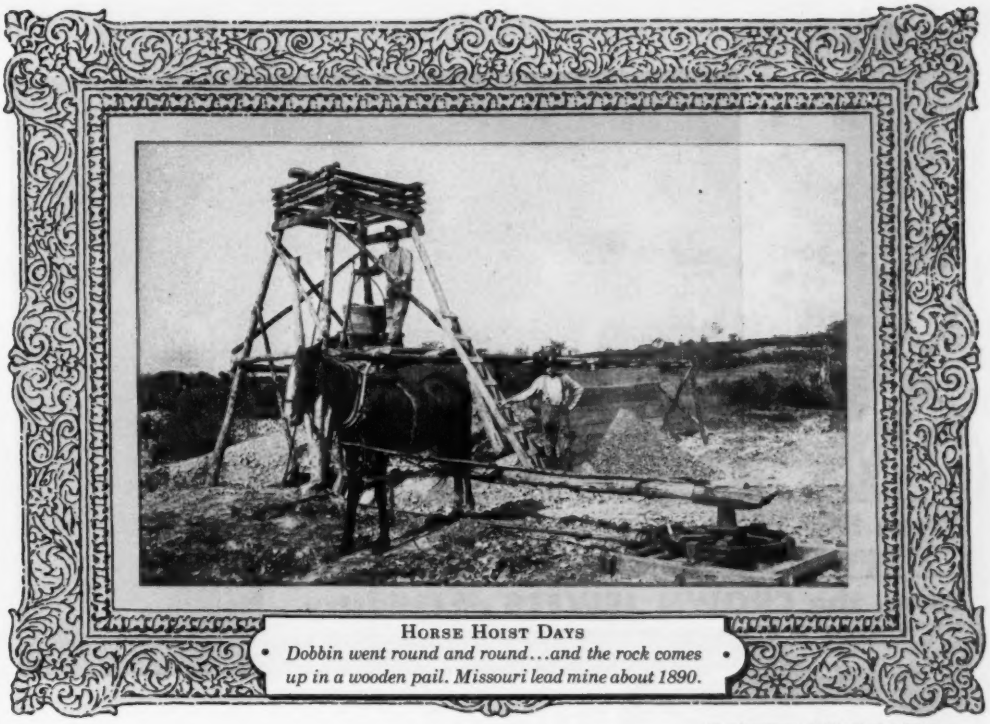
Write us for full details on any or all of these models:

22-T — 5⅝-in. to 6⅝-in. holes
27-T — 6 -in. to 6⅝-in. holes
29-T — 6 -in. to 9 -in. holes
42-T — 9 -in. to 12 -in. holes

Diesel or electric power is available for all machines — gasoline for all except 42-T.

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN



HORSE HOIST DAYS

*Dobbin went round and round...and the rock comes up in a wooden pail. Missouri lead mine about 1890.*

An enlargement of this photo suitable for framing is yours for the asking.

# Times Have Changed . . .

Hoisting rock with living horsepower, old-fashioned blasting methods and other inefficient mining techniques have become so obsolete that no operator could afford to use them today.

Times have changed . . . and so have blasting methods!

The latest major development in underground blasting techniques is the use of milli-second delay detonators—pioneered by Atlas in the ROCKMASTER® Blasting System. With proper drill pattern and loading, the one-two punch of split-second detonation gives breakage never before possible in hard rock mining. And there's no substitute for good breakage to assure maximum production from loading, hauling and crushing equipment.

Are your blasting methods up-to-date? You can find out by sending for the free 20-page booklet on ROCKMASTER blasting. It will pay you to investigate!

**ATLAS** EXPLOSIVES *"Everything for Blasting"*

CHEMICALS ATLAS EXPLOSIVES

**ATLAS POWDER COMPANY, Wilmington 99, Del. • *Offices in principal cities* • *Cable Address—Atpowco***

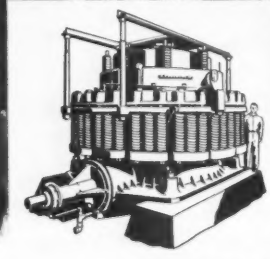
*Photo from DeBeers Consolidated Mines, Ltd.*

**from this BLUE GROUND . . .**

**come the CROWN JEWELS of Industry**

DIAMONDS have been the supreme jewels for centuries—yet the real value of the diamond today is found in its industrial applications, where fully 75% of the diamonds mined are used. In South Africa, the largest diamond producing region in the world, these *crown jewels of industry* are found deep in the earth, in volcanic rock known as *blue ground . . . and for every ton of blue ground mined, less than 1/8th carat is recovered.*

Of prime importance to the major diamond mines of South Africa is a dependable method of crushing the blue ground to the required fineness without destroying the diamond crystals, yet maintaining a minimum cost per ton produced. This important combination is found in the *"SYMONS"* Cone Crusher . . . and extensive installations of these crushers, as well as *"SYMONS"* Vibrating Screens, in the world's diamond mines testify to their ability to maintain, year after year, *continuous high capacity production with uninterrupted, trouble-free service.*



• "SYMONS" Cone . . . the machines that revolutioni . . . crushing practice . . . are built in Stan . . . Short Head, and Intermediate types . . . crushing heads from 22 inches to 7 . . . in diameter —in capacities from 8 to 2 . . . per hour.

C552

**NORDBERG MFG. CO., Milwaukee, Wisconsin**

*"SYMONS"... A NORDBERG TRADEMARK KNOWN THROUGHOUT THE WORLD*

NORDBERG

MACHINERY FOR PROCESSING ORES and INDUSTRIAL MINERALS

NEW YORK • SAN FRANCISCO • SPOKANE • WASHINGTON • TORONTO

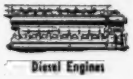
MEXICO, D. F. • LONDON • PARIS • JOHANNESBURG

"SYMONS" Primary Crushers

Grinding Mills

Mine Hoists

"SYMONS" Vibrating Bar Grizzlies and Screens



Diesel Engines

# longer service from Tungsten-Carbide Bits

The CP Airleg provides a rigid, well-balanced support for the drill and effectively absorbs all recoil. A CP ratchet throttle (exclusive) maintains balanced feed leg pressure and keeps the bit in constant contact with the rock. This fine balance of feed pressure prevents "slapping," and minimizes the danger of fracturing tungsten-carbide bits.

Available in 1⅞" and 2⅛" feed cylinder diameters, and with 36" and 48" feed travel, the Airleg is ideal for use with CP Sinkers, particularly the general utility, 45 lb. class CP-32 and the 55 lb. class CP-59.

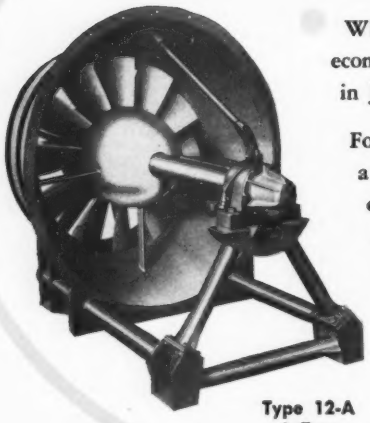
*Write for detailed information.*

CHICAGO PNEUMATIC TOOL COMPANY

General Offices: 8 East 44th Street, New York 17, N. Y.

Fiftieth Anniversary

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



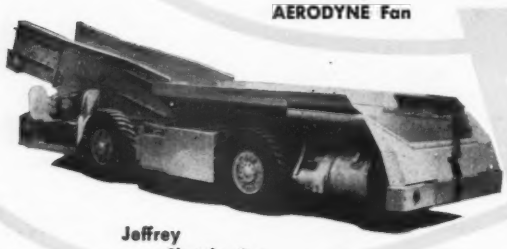
Type 12-A
Jeffrey
AERODYNE Fan

Whether a question of proper ventilation or the most economical method of transportation you will find the answer in Jeffrey engineered equipment for Metal Mine operation.

For instance, the Jeffrey 12-A AERODYNE Fan operates at a lower speed yet still maintains the high efficiencies characteristic of these ventilation units over many years. And for low cost transportation Jeffrey offers sturdy, long-lived Locomotives (trolley or storage battery), Belt Conveyors and Shuttle Cars depending upon the nature of your operation.

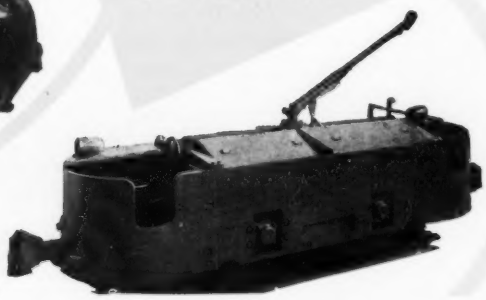
There is a Jeffrey engineer available to help you. Consult him on your needs.

JEFFREY
EQUIPMENT
assures lower costs
for your metal mine
operations



Jeffrey
Shuttle Car

64-A Belt Conveyor Head



Trolley Type Haulage Locomotive

THE JEFFREY MANUFACTURING COMPANY

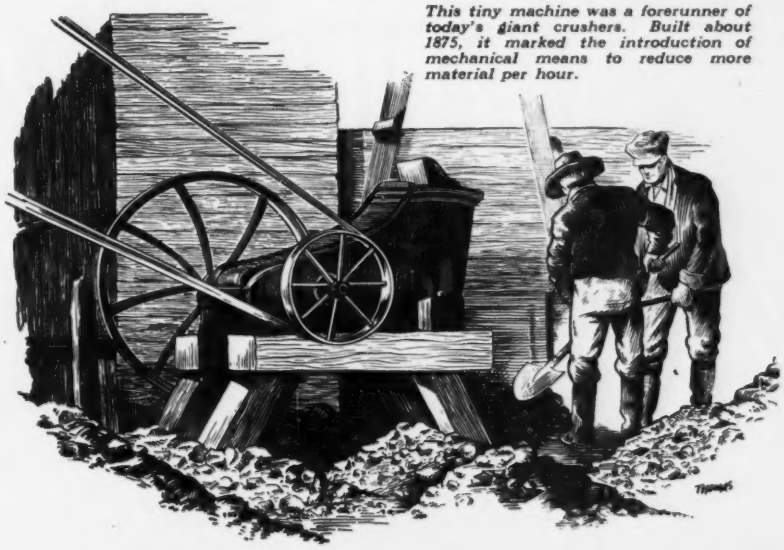
75 YEARS

974 North Fourth St., Columbus 16, Ohio

Baltimore 2 Boston 16 Cincinnati 2 Detroit 13 Houston 2 New York 7 St. Louis 1
Beckley, W. Va. Buffalo 2 Cleveland 15 Forty Fort, Pa. Jacksonville 2 Philadelphia 3 Salt Lake City 1
Birmingham 3 Chicago 1 Denver 2 Harlan, Ky. Milwaukee 2 Pittsburgh 22

Jeffrey Mfg. Co. Ltd., Montreal, Canada
British Jeffrey-Diamond Ltd., Wakefield, England
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S. A.
The Galion Iron Works & Mfg. Co., Galion and Bucyrus, Ohio
Galion (Great Britain Ltd.), Wakefield, England
The Ohio Malleable Iron Co., Columbus, Ohio
The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio

## *A promise of bigger things to come*



*This tiny machine was a forerunner of today's giant crushers. Built about 1875, it marked the introduction of mechanical means to reduce more material per hour.*

The Traylor TC Gyratory, with its curved concaves and bell head, typifies advanced Traylor design for efficient operation. See Bulletin 128 for complete details.

**Step by step,** little machines and crude inventions have been developed into powerful, more efficient equipment to keep pace with the needs of a growing nation. For 50 years, Traylor has made it a policy to *lead* in the development and production of better machinery for the mining industry. In that time, mining men have come to depend on the skill and experience of Traylor to supply them with the tools they need. They know that when they consult Traylor, they consult experience . . . half a century of it.

OUR GOLDEN ANNIVERSARY YEAR

1902 — 1952

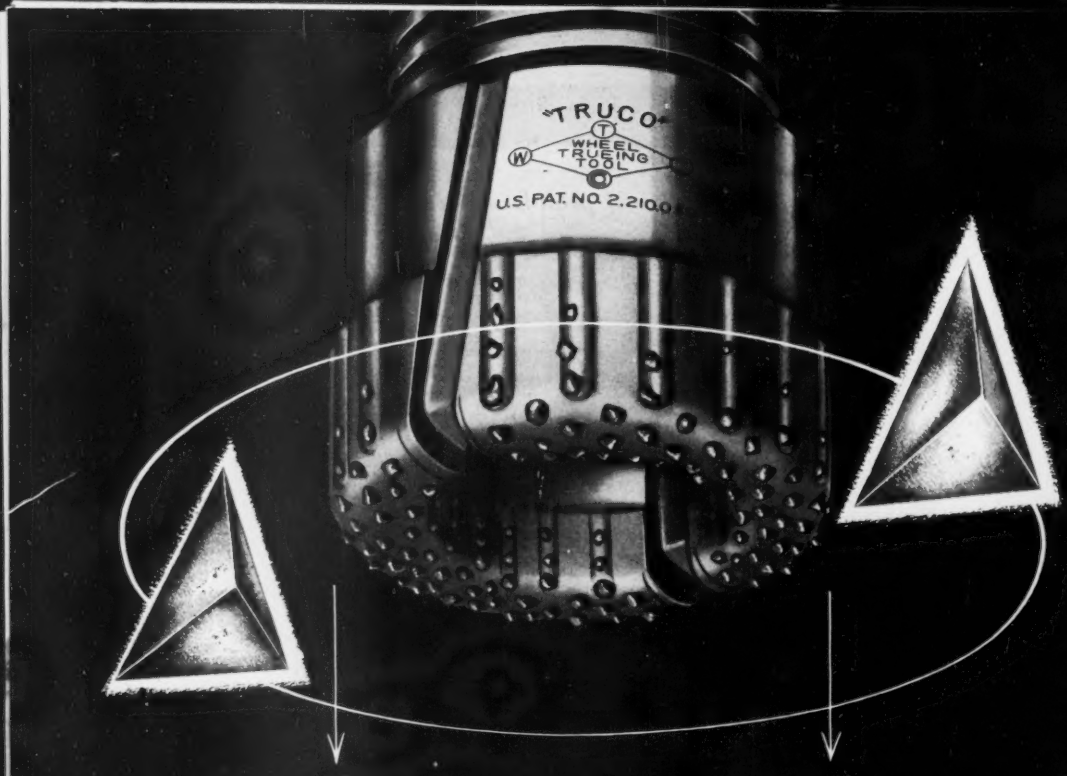
**TRAYLOR ENGINEERING & MANUFACTURING CO.**

**1412 MILL ST., ALLENTOWN, PA.**

SALES OFFICES: New York • Chicago • San Francisco

Canadian Mfrs: Canadian Vickers, Ltd., Montreal, P. Q.

*a* **Traylor** *leads to greater profits*




## ATOMIC SCIENCE FOR DRILLERS

Every driller should know this much about atomic science; the diamond is the world's greatest cutting element because of its atomic structure.

It starts with a diamond atom shaped like one of the pieces shown above—a tetrahedron. Even the tiniest, fine industrial diamond contains billions of these tetrahedron diamond atoms, always arranged in the same crystalline formation, always producing the same atomic structure, and always with one important peculiarity: At each cleavage plane there is a "hard vector" or "rib" which is harder and has more cutting power than any other part of the diamond.

For centuries, it has been the objective of good diamond setting practice to locate the "rib" and set it "toward the work," as is done today in setting Truco Diamond Drill Bits, so that the driller gets the benefit of the diamond's utmost cutting power —delivered in the form of maximum footage at minimum cost.

**WHEEL TRUEING TOOL COMPANY**
3200 W. DAVISON AVENUE, DETROIT 6, MICHIGAN

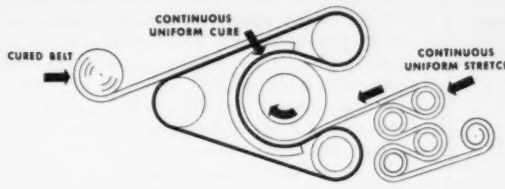
**WHEEL TRUEING TOOL CO. OF CANADA, LTD.**
575 LANGLOIS AVENUE, WINDSOR, ONTARIO, CANADA

# Like "Whodunits"?

## Many Engineers Have Solved the Mystery of Early Conveyor Belt Failure — They Specify

# BWH Rotocured Belts (and prevent OCS*)

**DIAGRAMMATIC SKETCH OF EXCLUSIVE ROTOCURE PROCESS**



*Overcured Sections — segments 2" to 4" wide present every 30' to 40' in all belts made by the flat press method.

Early failure of many conveyor belts is no "mystery" when you realize the limitations of conventional flat press curing compared to BWH Rotocuring. Flat press belts "carry the seeds of their own destruction" because they are cured by a process of press overlaps which weaken the structure. Each cured section in this process advances less than a full press length, hence segments receive a *double* curing.

BWH ROTOCURED BELTS *cannot* come to you with these weakened sections because they are made by an entirely different process. We call it "ROTOCURE" — you'll call it "a definite cost saver"! Actually it's a process of continuous, endless, constant motion curing. Because there are no press overlaps, there are no weak segments.

Users with the toughest conveying problems who have switched to BWH Rotocured Belts are getting more service and performance for their money in:

1. **Stepped-up belt flex life (up to 40%)**
2. **Elimination of mechanical distortion at the press ends**
3. **Constant, uniform stretch**
4. **Uniform, abrasion-resistant covers**

Your BWH distributor is a specialist who knows how to put these advantages to work on *your* conveying problems . . . ask him *in* — and ask him also about BWH Transmission Belts. (They operate at lower tension and hence last longer).

BWH — DEPENDABLE RUGGEDNESS

*Another Quality Product of*

**BOSTON WOVEN HOSE & RUBBER COMPANY**

Warehouse Stock: 111 N. Canal St., Chicago, Illinois **Distributors in all Principal Cities**

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS., U. S. A.

# For Rugged Service Specify GEOPRENE

## *and be convinced*

### MAKE THIS *Comparison*

**Check these figures, and compare typical Geoprene values with ASTM requirements.**

| ORIGINAL | ASTM Requirements | Geoprene Typical Values |
|---|---|---|
| Tensile strength, lb/sq in. | 1800 | 3000 |
| Percent elongation | 300 | 500 |
| Set in 2-in. test piece, in. | 3/8 | 1/16 |
| After 7 days in Geer oven at 70 C | | |
| Tensile strength, lb/sq in. | 1600 | 2900 |
| Percent elongation | 250 | 430 |
| After 96 hr in oxygen bomb at 70 C | | |
| Tensile strength, lb/sq in. | 1600 | 2800 |
| Per cent elongation | 250 | 430 |
| After 18 hr in oil at 121 C | | |
| Per cent depreciation in tensile strength | 40 | 35 |
| Per cent depreciation in elongation | 40 | 35 |
| Tear Test | | |
| Tensile strength, min lb/in. | 40** | 75 |

**This is the requirement for rubber jackets; no tear value has yet been set for neoprene-type jackets.

**General Electric Wires and Cables**

**FOR MORE TONS PER MACHINE PER DAY!**

On the tough jobs—wherever you use portable tools or heavy equipment—specify tough, abrasion-resistant General Electric Geoprene cable. Geoprene's rugged neoprene-based jacket resists oils, acids, alkalies, sunlight, and flame. A tough, corded reinforcing mesh enables it to take the hauling and dragging that your job requires. Specify Geoprene cable. Let it convince you by on-the-job results that G-E Geoprene cable offers extra service, extra tons per dollar.

In the full line of General Electric wires and cables you'll find the cable you need. This famous line includes: G-E No. 1799 varnished-cambric insulated cables, Super Coronol* cable, wire armored cable, interlocked armor cable, aerial cables, and mine telephone cable . . . Flamenol* control wire and magnet wire.

Send for your free copy of the 24-page booklet, *General Electric Wire and Cable for the Mining Industry*. Section **W-29-895**, Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

*Registered Trade-mark of General Electric Company

*You can put your confidence in—*

**GENERAL ELECTRIC**

# GREFCO BASIC BRICK For All Industry

The metallurgical industry demanded furnace linings capable of withstanding extremely high temperatures under extraordinary operating conditions. To meet this challenge, Grefco research produced the famous RITEX unburned basic brick—one of the outstanding advances in the entire history of brick manufacture. RITEX brick possess great accuracy to specified dimensions. They are more resistant to thermal spalling . . . offer lower porosity, lower thermal conductivity, and higher hot strength. These properties insure increased service at reduced cost.

**STEELKLAD For Tough Duty**

For service too tough even for RITEX, Grefco offers STEELKLAD, an unburned basic brick, permanently jacketed in a patented steel shell. The brick will not slide from its shell in the construction of a furnace wall. When the furnace is heated the steel oxidizes and is absorbed by the brick. It provides an exceptionally efficient monolithic lining that outlasts all other brick in basic open-hearth steel furnaces, electric-arc furnaces, soaking pits, copper smelting and refining furnaces, and other basic metallurgical furnaces.

**Take A Look At STEELKLAD**

Shown below is a typical STEELKLAD basic brick, steel-jacketed on the four major faces, and containing Grefco's unburned magnesite-chrome brick. The brick itself is exclusive and patented—as is the permanent steel shell. It may mean major savings in your operation. Write, wire or phone General Refractories in Philadelphia—or contact your nearest dealer.

# Money... made with brick!

WHATEVER YOU BUY—IT'S BECAUSE OF BRICK!
*Refractory* brick, the only product capable of lining the furnaces that produce the silver, nickel and copper for our coins—the paper for our dollar bills. And, most everything we buy with our money also owes its origin, in part, to refractory brick.

SUCH REFRACTORY BRICK AS RITEX AND STEELKLAD popular basic brick made by General Refractories Company for virtually all metallurgical furnaces. These leading favorites are exceptionally capable of resisting destructive forces—providing long life at high temperatures.

66 GREFCO MINES AND MANUFACTURING PLANTS, here and overseas—together with 18 sales offices, hundreds of distributing agencies, and the most modern of research facilities—deliver a truly *complete refractories service.*

FOR BASIC, FIRECLAY OR SILICA BRICK—MORTARS, CASTABLES OR BULK REFRACTORIES—CALL ON GREFCO!

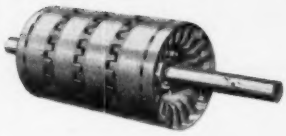
**GENERAL REFRACTORIES COMPANY**

**PHILADELPHIA**

# Which Answers Your Tramp Iron Problem BEST?

## MAGNETIC PULLEYS?

Powerful, air cooled electro magnetic pulleys are ideal where well loaded conveyor belts are used. Installed as head drive pulley, tramp iron is discharged automatically. Low operating cost, long life and extreme power characterize this workhouse of the Dings line. Catalog C-1001A tells you why this magnet is exceptionally efficient.



Dings *non-electric, self-energized* Perma Pulley magnets are recommended where burden depths do not exceed 3". Within this range, these are the magnets to use because of their unsurpassed concentration of magnetic strength near the surface. Catalog C-1007A.

## SUSPENDED RECTANGULARS?

Power close and power that searches down as deep as 30" to yank tramp iron out. If the Dings RM rectangular won't do it, it can't be done. Triple pole, double gap design. Install horizontally, vertically or at an angle above belt conveyors or in chutes. Self-cleaning fully automatic models also available. Write for details.

## MAGNETIC DETECTOR?

The Dings Magnetic Detector instantly signals when any magnetic object large enough to be damaging passes through the detector zone. Can be hooked up to sound an alarm and stop the belt. Ideal protection for crushers, grinders, pulverizers, etc., where belt speeds are so excessive or burden depths so great no magnetic separator can fuction successfully. Detectors are available for belt widths from 18" to 72". Two types are available. One employs an electro magnet and the other, a permanent magnet. Performance of the two is comparable.

**Magnets shown here are available in size ranges for most applications. Special magnets can be made for any application. Write today for recommendations.**

**DINGS MAGNETIC SEPARATOR CO.**
**4719 W. Electric Ave., Milwaukee 46, Wis.**

Dings Certified MAGNETIC STRENGTH

# *in WIRE ROPE, too, longer life depends on the RIGHT KIND of muscle*

Massive, muscular structure gives the elephant the overpowering strength he needs to ward off the attacks of predatory enemies. Even in a hostile environment, these huge animals may stretch out their life span to well over a hundred years.

In wire rope, too, prolonged life is dependent on specialized muscles that will give best resistance to the destructive forces encountered... whether they be abrasion, bending fatigue, load strain or shock stress. That is why in Wickwire Rope we make sure that you get the right grade of steel and size of wire... the right construction and lay of the rope... in short, the right kind of muscle for your particular job.

For full information contact our nearest sales office.

WICKWIRE ROPE
A CF&I PRODUCT

*A YELLOW TRIANGLE ON THE REEL IDENTIFIES WICKWIRE ROPE*

THE COLORADO FUEL AND IRON CORPORATION—Abilene (Tex.) • Denver • Houston • Odessa (Tex.) • Phoenix • Salt Lake City • Tulsa
THE CALIFORNIA WIRE CLOTH CORPORATION—Los Angeles • Oakland • Portland • San Francisco • Seattle • Spokane
WICKWIRE SPENCER STEEL DIVISION—Boston • Buffalo • Chattanooga • Chicago • Detroit • Emlenton (Pa.) • New York • Philadelphia

**WICKWIRE ROPE**

CF&I

PRODUCT OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

9109

# S-A CONVEYING Systems

## prove their efficiency in Handling Ore . . . AT LOW COST PER TON

Belt Conveyors
Belt, Pan & Plate Feeders
Ship Loading Boom Conveyors
Stacking Conveyors
Storage & Reclaiming Systems
"Natural Frequency" Vibrating Conveyors
REDLER Conveyor-Elevators
ZIPPER Conveyor-Elevators
Conveyor Belt Cleaners
Headshaft Holdbacks
Grizzlies & Screens
Centrifugal Pilers
Bin Gates & Tunnel Gates
Car Pullers & Spotters
Bucket Elevators
Skip Hoists
SEALMASTER Ball Bearing Units

• *Write for a bulletin on any of the above.*

When S-A engineers tackle any bulk materials handling problem, they have two tremendous assets in their favor.

1. They draw upon the cumulative experience gained through thousands of installations engineered by S-A to meet just about every kind of bulk materials handling need.

2. In addition, they have a complete line to work with that includes *all* types of bulk materials handling equipment.

This combination of experience plus the *exact* unit or combination of units needed to do *your* job, is sound assurance that S-A can design and build conveying systems that will move your materials at lowest cost per ton. No matter how simple or complex your handling needs, write us when we can help you.

This S-A System of belt conveyors moves iron ore from receiving hoppers through crushing and grading operations to storage, then reclaims the ore from storage and loads it into rail cars at rates up to 500 tons per hour. A 500-foot belt conveyor on an elevated trestle has a self-propelled belt tripper that discharges ore into any desired storage area.

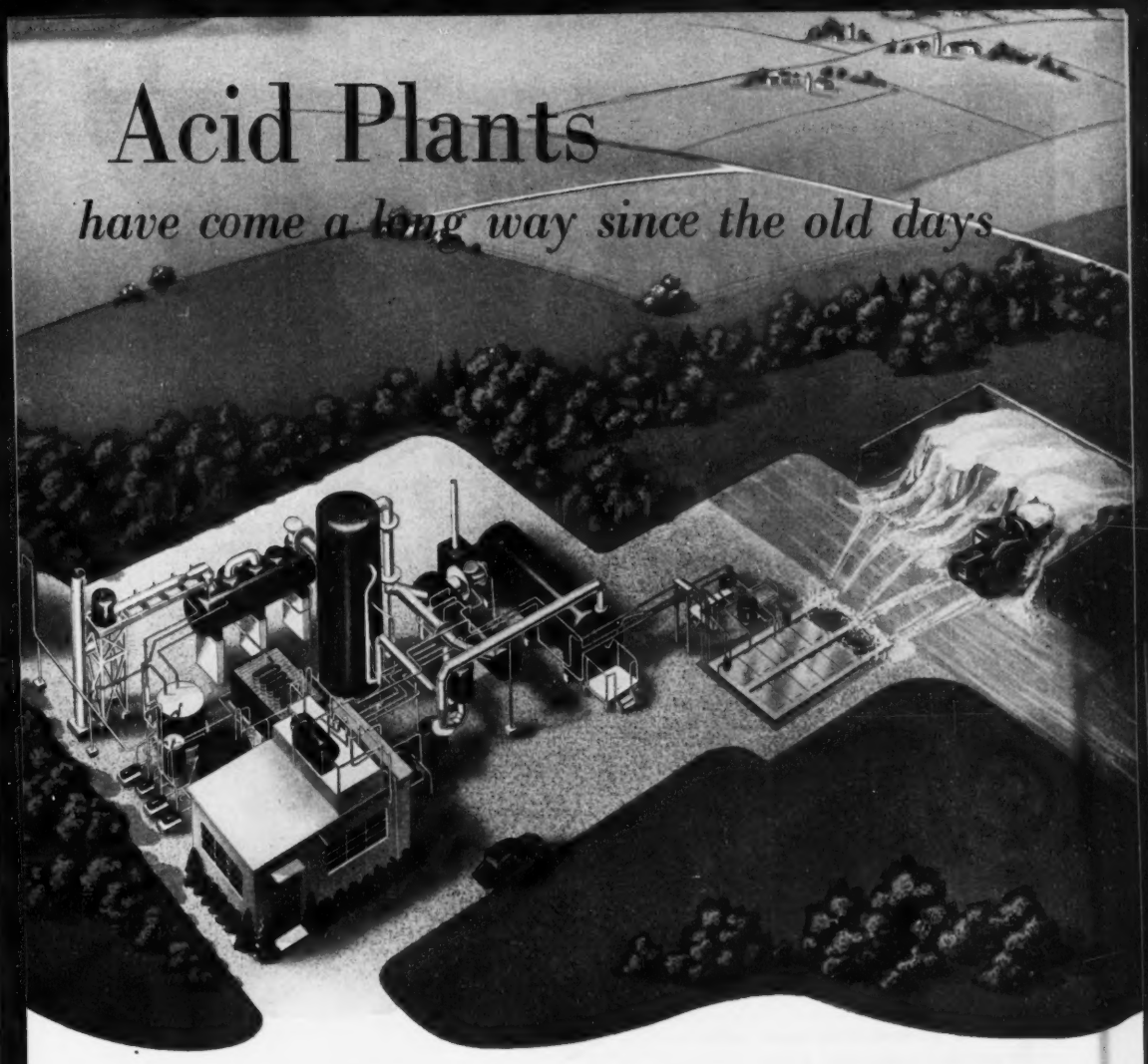
STEPHEN S-A DAMSON MFG. CO.

4 Ridgeway Avenue, Aurora, Illinois — Los Angeles, Calif., Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

# Acid Plants

## *have come a long way since the old days*



At the turn of the century, virtually all sulfuric acid was made by the chamber process. A 50-ton per-day unit was a large installation and chamber acid had a maximum strength of 77 per cent.

Today's contact acid plants are a far cry from the old days. Units are modern and functional in design—efficient and reliable in operation. Single units producing up to 500 tons per day are becoming commonplace and acid of any strength is produced.

Chemico is responsible for many of the developments that account for this vast improvement. Chemico pioneered and pointed the way in the use of—

**a. Pre-molten brimstone and spray sulfur burners**

**b. Pre-dried air for combustion of sulfur**

**c. Centrifugal blowers and pressure sulfur furnaces**

**d. Boilers to utilize waste heat of sulfur combustion**

**e. Economizers to utilize converter heat**

**f. Highly efficient, non-poisonable vanadium catalyst**

**g. Quench converters for high catalytic conversion**

**h. Acid wastes for production of fresh acid**

These advances resulted in simpler, more reliable plants—higher efficiency—lower investment—conservation of manpower. Today more than ever, Chemico designed and built plants are profitable investments.

**CHEMICAL CONSTRUCTION CORPORATION**

A UNIT OF AMERICAN CYANAMID COMPANY

488 MADISON AVENUE, NEW YORK 22, N. Y.

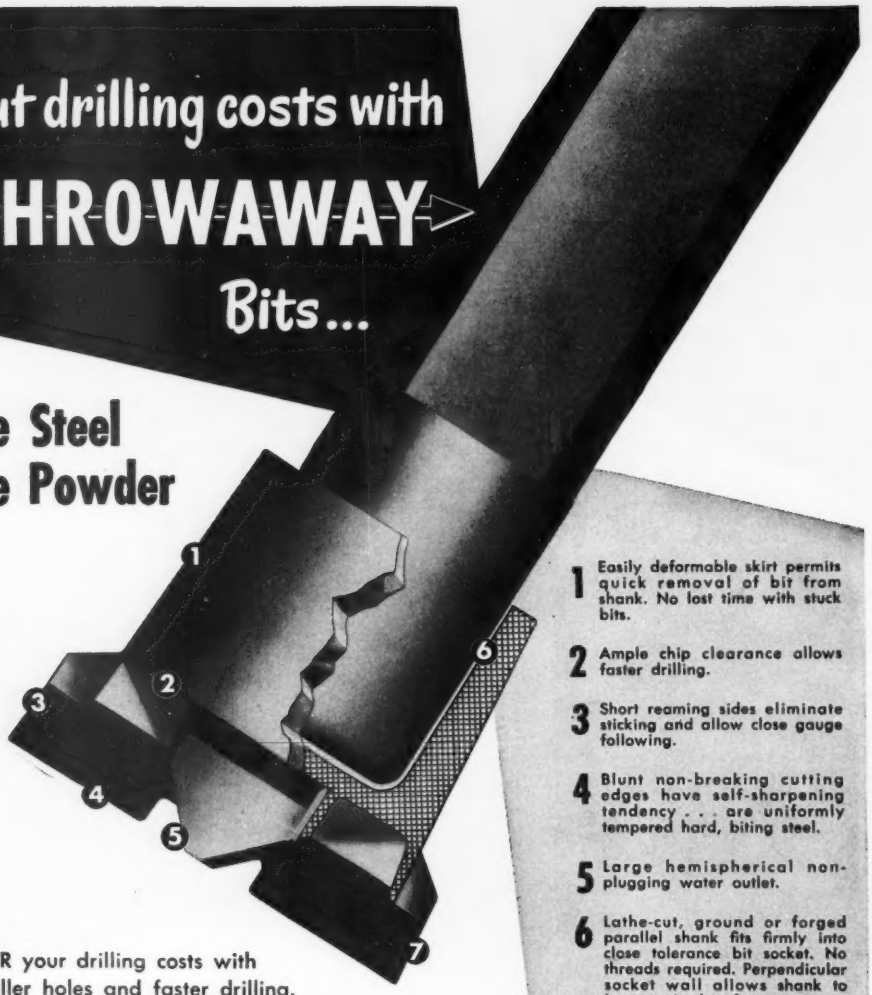
TECHNICAL REPRESENTATIVES: CYANAMID PRODUCTS LTD., LONDON • CHEMICAL CONSTRUCTION (INTER-AMERICAN) LTD., TORONTO • SOUTH AFRICA CYANAMID (PTY) LTD., JOHANNESBURG

*Chemico plants are profitable investments*

CC 839

# Cut drilling costs with THROWAWAY Bits...

## Save Steel
## Save Powder




1 Easily deformable skirt permits quick removal of bit from shank. No lost time with stuck bits.

2 Ample chip clearance allows faster drilling.

3 Short reaming sides eliminate sticking and allow close gauge following.

4 Blunt non-breaking cutting edges have self-sharpening tendency . . . are uniformly tempered hard, biting steel.

5 Large hemispherical non-plugging water outlet.

6 Lathe-cut, ground or forged parallel shank fits firmly into close tolerance bit socket. No threads required. Perpendicular socket wall allows shank to bottom in bit for maximum performance.

7 Perfect uniformly treated bit teeth assure best possible cutting power and smooth operation.

LOWER your drilling costs with smaller holes and faster drilling. Bottom with 1¼ inch holes and save costly steel and powder. Let us prove to you that the man at the drill can do more work for less cost with a Throwaway Bit. Write for new low price list and technical description of Throwaway Bit to: Portland, Oregon home office or distributors listed below. Competent field engineers and dealers are always at your service.

**THROWAWAY BIT CORPORATION**

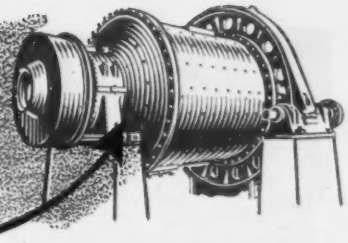
**4200 N. W. YEON AVENUE., PORTLAND, OREGON**

**BONNE TERRE FARMING & CATTLE CO**
Bonne Terre, Missouri

**CREATING ENGINEERING**
825 1st National Bank Building
Denver, Colorado

**GREENAWALT-WHEELOCK & CO.**
415 Mills Building
El Paso, Texas

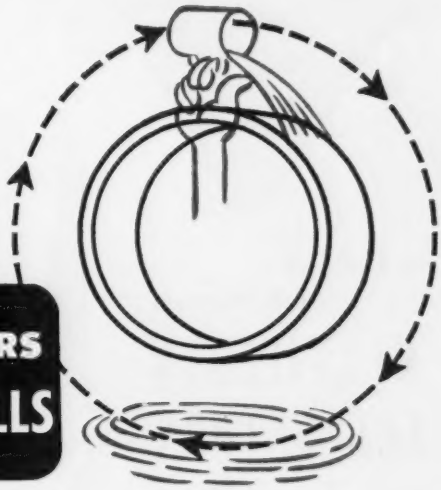
# "Inside Story"



## of Allis-Chalmers Oil Lubricated Trunnion Bearing...

AN OILING BUCKET inside this Allis-Chalmers trunnion bearing revolves with the trunnion . . . lifts oil from the reservoir in the bottom of the bearing housing to an oil distributing pan above the bearing. From here it floods down onto the bearing, lubricating the full face of the bearing uniformly and continuously.

You'll always have the comforting assurance that the all-important trunnion bearing on your mill is being dependably lubricated. This assured protection of internal lubrication is standard on all Allis-Chalmers oil lubricated bearings — even on installations where a separate external oiling system is used. A-3722



**ALLIS-CHALMERS**
**GRINDING MILLS**

These protective features of A-C trunnion bearings also give you savings in power and maintenance —

- ★ An improved seal keeps dirt out of oil and has been designed to provide for mill expansion.
- ★ A hand operated, high pressure lubricant pump "floats" the mill after shut-down . . . eliminates dry starting.
- ★ If desired, an external system for filtering and cooling can be added to the internal oiling system.

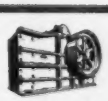
*Get more facts from the Allis-Chalmers representative in your area, or write for Bulletin 07B6718A. Allis-Chalmers, Milwaukee 1, Wis.*

# ALLIS-CHALMERS

**Sales Offices in Principal Cities in the U. S. A. Distributors Throughout the World.**

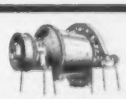
Hammermills

Vibrating Screens



Jaw Crushers

Gyratory Crushers



Grinding Mills

Kilns, Coolers, Dryers

**No wonder "MULTICLONE" *is the leading name in the centrifugal recovery of dust and fly ash from all types of gases, hot or cold.***

No other mechanical recovery equipment has so many years of dust and fly ash recovery experience behind it . . . or has such uniformly high collecting efficiency . . . or provides so many other money-saving, space-saving advantages as MULTICLONE. The four advantages outlined below are by no means the complete MULTICLONE story, but are typical of the vital savings found *exclusively* in MULTICLONE equipment . . .

**in dust and fly ash recovery**

# MULTICLONE COLLECTORS

***and only Multiclones* give vital advantages like these . . .**

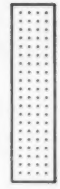
### Uniformly High Recovery:

MULTICLONE'S multiple *small diameter* tubes—made possible by its exclusive vane design—whirl the dirty gases with greater centrifugal force, thus throwing out not only the large, medium and small particles, but also a high percentage of the *extremely small* particles of 10 microns and less. This, coupled with the fact that there are no pads or filters to become choked with recovered material, results in a more complete recovery of *all* suspended materials from the gas stream.

### Space-Saving Compactness:

Plant space costs money—so be sure to check space requirements carefully. As shown in the accompanying chart, the MULTICLONE requires less floor space and less cubic space than any other unit of comparable capacity and performance. Translate these savings into today's high costs for plant space and you readily see the great importance of this one MULTICLONE advantage alone!

| Make | Relative Space Requirements In Sq. Ft. | In Cu. Ft. |
|---|---|---|
| Multiclone | 1.0 | 1.0 |
| Collector A | 2.1 | 1.6 |
| Collector B | 5.9 | 3.2 |
| Collector C | 6.8 | 5.9 |



Long and narrow

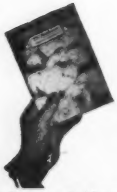
Square

### Maximum Adaptability:

In addition to its unusual compactness, the MULTICLONE is also unusually adaptable to various installation requirements. Where head room is low it can be installed with side-inlet side-outlet connections. Where side clearances are restricted, it can be installed with side-inlet top-outlet connections. In addition, without changing capacities, the shape of the unit can be varied—long and narrow, short and wide, or square—to fit restricted spaces . . . and its single-inlet single-outlet duct requirements permit greater flexibility and simpler installation. These savings slice installation costs, space requirements and insulating expense.

### Minimum Maintenance:

The MULTICLONE has no high speed moving parts to repair or replace . . . no pads or filters to clean or renew . . . nothing to choke the gas flow or increase draft losses as suspended materials are recovered. MULTICLONE draft losses remain uniformly low *at all times*. Further, the recovered material from an entire bank of tubes is collected in a *single* hopper—far easier to service and maintain than the multiple hoppers of conventional cyclone units.



**FREE INFORMATIVE BOOKLET**
This 32 page booklet outlines the basic principles of centrifugal dust recovery and shows the many ways MULTICLONE advantages assure higher recovery at lower overall costs. A free copy of this booklet will gladly be sent on request. Write today!

**Before you decide on *any* recovery equipment be sure to get complete information on MULTICLONE advantages. A letter, wire or phone call to our nearest office places this information in your hands without obligation. Get *all* the facts and you will get MULTICLONE Collectors!**

WESTERN Precipitation CORPORATION

ENGINEERS, DESIGNERS & MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

Main Offices: 1012 WEST NINTH STREET, LOS ANGELES 15, CALIFORNIA
CHRYSLER BLDG., NEW YORK 17 • 1 LaSALLE ST. BLDG., 1 N. La SALLE ST., CHICAGO 2 • HOBART BUILDING, SAN FRANCISCO 4, CALIFORNIA
PRECIPITATION CO. OF CANADA, LTD., DOMINION SQ. BLDG., MONTREAL

# get FULL VALUE loading...
## choose GARDNER-DENVER Mine Car Loaders

**a FULL *dipper every bite . . .***

**because two high torque air motors function together on the powerful crowding action—and the Gardner-Denver moving fulcrum provides extra force for digging into stubborn muck piles.**

**FULL *to the top mine car loads . . .***

**Extra speed developed by the moving fulcrum as the dipper nears discharge position throws the ore far back to completely fill your big capacity mine cars.**

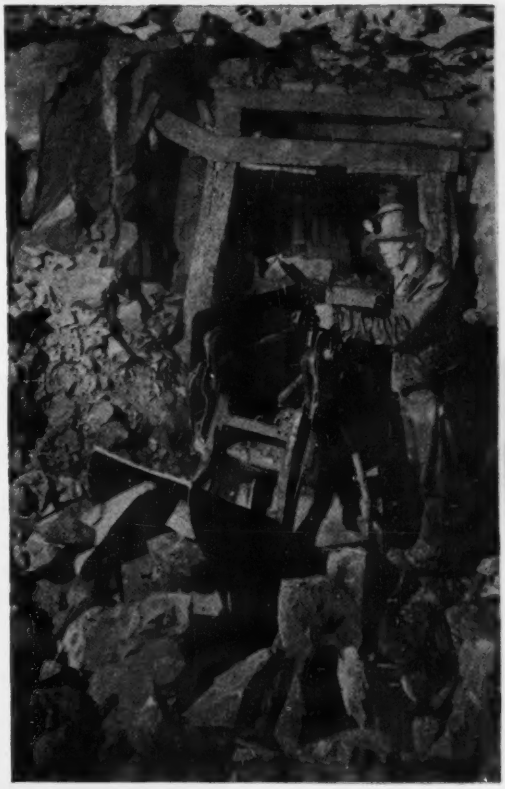
**FULL *time availability . . .***

**Heavy-duty construction, fewer moving parts and protected lubrication keep Gardner-Denver Mine Car Loaders underground—enable you to plan on using your Gardner-Denver Loader 'round the clock, at several different faces.**

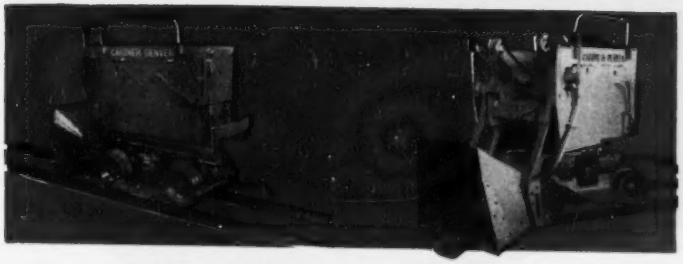
**FULL *measure of safety . . .***

**Low center of gravity, clean exterior design, simple and convenient controls and other safety features protect your miners against injury.**

**Send today for Bulletin MCL.**



Gardner-Denver Loader quickly cleans up a round of coarse, abrasive muck.



The smaller GD9 Mine Car Loader—for fast loading in low or narrow headings.

The GD14 "Big Bite" Loader—for high tonnage loading into big mine cars.

SINCE 1859 **GARDNER-DENVER**

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., Toronto, Ontario

**THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS**

# STURTEVANT

## *Dustless* BLENDERS

### Produce Perfectly Mixed Products with NO Loss of Materials

**RECEIVING**

The ingredients to be mixed enter the mixing chamber of the drum through a chute. Note scoops which carry up and dump the ingredients as the drum rotates.

**DISCHARGING**

By simply throwing a lever, the inlet is closed and the mixer is in discharging position. The completely mixed materials drop off the lifting scoops and discharge through chute without segregation of ingredients

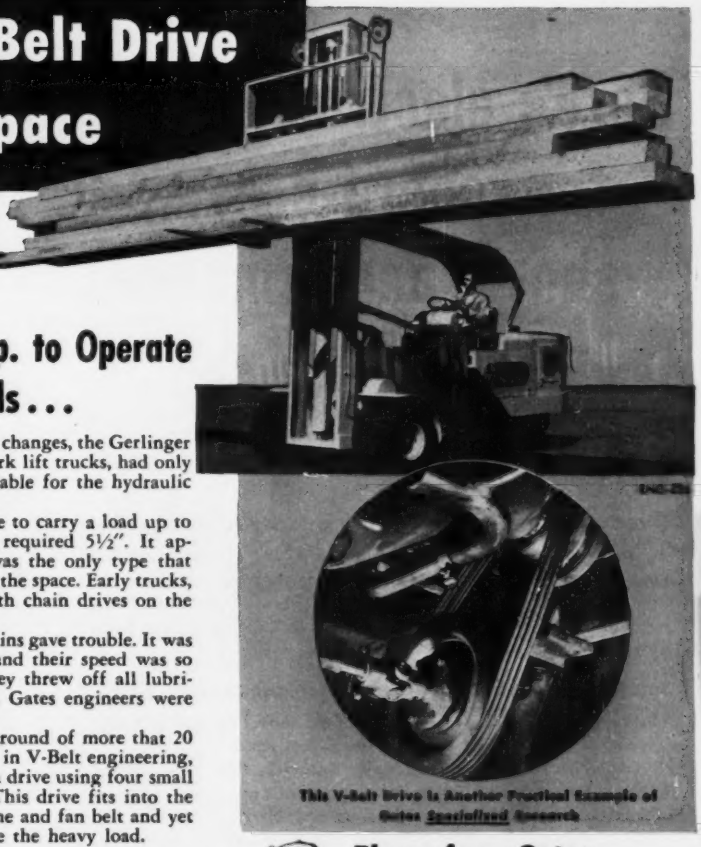
***Four-way mixing action produces homogeneous blends.*** No matter what the densities, weights, finenesses or other physical properties of the ingredients, Sturtevant Dustless Blenders provide *a thoroughly blended product* with no substances floating to remain unmixed. Sturtevant advantages include—single opening for both receiving and discharging . . . "open door" accessibility for quick, thorough cleaning . . . rugged construction for long life and minimum maintenance. Sturtevant Dustless Blenders are available in mixing capacities from 500 to 20,000 pounds. Write for information or engineering assistance.

**STURTEVANT MILL COMPANY**
**101 CLAYTON STREET, BOSTON 22, MASS.**

*Designers and Manufacturers of*

CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

# Unique 4 Belt Drive Fits 2¼" Space



This V-Belt Drive is Another Practical Example of Gates Specialized Research

## Transmits 34 h. p. to Operate Hydraulic Controls . . .

Unless they made costly changes, the Gerlinger Carrier Co., makers of big fork lift trucks, had only 2¼" on the crankshaft available for the hydraulic pump drive.

A standard V-Belt drive to carry a load up to 34 horsepower would have required 5½". It appeared that a chain drive was the only type that could handle the load and fit the space. Early trucks, therefore, were equipped with chain drives on the hydraulic pumps.

In service, however, chains gave trouble. It was impractical to encase them and their speed was so high (3000 ft./min.) that they threw off all lubricants, and wore out rapidly. Gates engineers were asked for a solution.

Drawing upon a background of more that 20 years of *Specialized* Research in V-Belt engineering, Gates engineers worked out a drive using four small specially designed V-Belts. This drive fits into the crowded space between engine and fan belt and yet has ample capacity to handle the heavy load.

### *V-Belt drive has many advantages*

Unlike the chain drive, V-Belts require no lubrication, yet are quiet and positive and the multiple strands are an advantage because they assure uninterrupted operation. If one belt breaks, the others continue to carry the load until replacement can be made. A further advantage is that the early lift trucks can be equipped with the new drive at a minimum cost.

This is another example of the practical value of Gates engineering know-how applied to a critical design problem. Only rarely, of course, are special V-Belts required to solve such a problem, but the same engineering skill and experience is available to you—right in your own plant—for the solution of *any* power transmission problem you may have.

### Phone for a Gates Field Engineer

Whenever you have a difficult drive to design—or if some difficulty develops on any drive in your plant or if you only want to know what V-Belts to use for the most efficient, lowest cost service on any particular drive—just pick up your phone book and call the number listed under "Gates Rubber."

A Gates field engineer will call on you and put at your service all the facilities of Gates *Specialized* Research on V-Belts—*without the slightest obligation.*

**There are Gates engineering offices and jobber stocks in all industrial centers of the U.S. and 71 foreign countries.**

## The Gates Rubber Company • Denver, U.S.A.

®

*The World's Largest Maker of V-Belts*

Gates VULCO ROPE DRIVES

# Here's electrical equipment for record-breaking shovel performance!

This Westinghouse-equipped Marion shovel set a new world's record by removing over 1.5 million cubic yards of overburden in just one month at an Eastern coal-stripping operation. In addition, another Westinghouse-equipped shovel at the same mine stripped over 1.3 million yards.

### *Over a million yards a month averaged during 1951*

To attain this average, the shovel moved an average of over 2,000 yards per hour by moving 33.91 cubic yards per pass with an average time of 60.43 seconds per complete cycle. This fast operation is the result of the carefully co-ordinated design of Westinghouse generators, motors and Rototrol® control.

### *Smooth, controlled operation increases production*

The Rototrol control is the "brain" of the shovel operation. When fast action is necessary, as during the swing, Rototrol "forces" the electric drive. The responsive action is quick, fluid and smooth. This prevents any shocks to the equipment and speeds up your operation. Rototrol also makes it impossible to overstrain the machinery. For example, during the crowd operation, the motors will stall out rather than force the bucket and cables.

### *Dependability of equipment reduces down time*

The durability of the equipment is another reason for the record-breaking performance. The Rototrol, for example, is a simple, sturdy device that can be serviced right in the field. The M-G sets have special spherical-sleeve bearings which compensate for misalignment and permit operation even at tilts of 15°. The motors are designed and built to insure maximum durability.

### *Call Westinghouse on your next project*

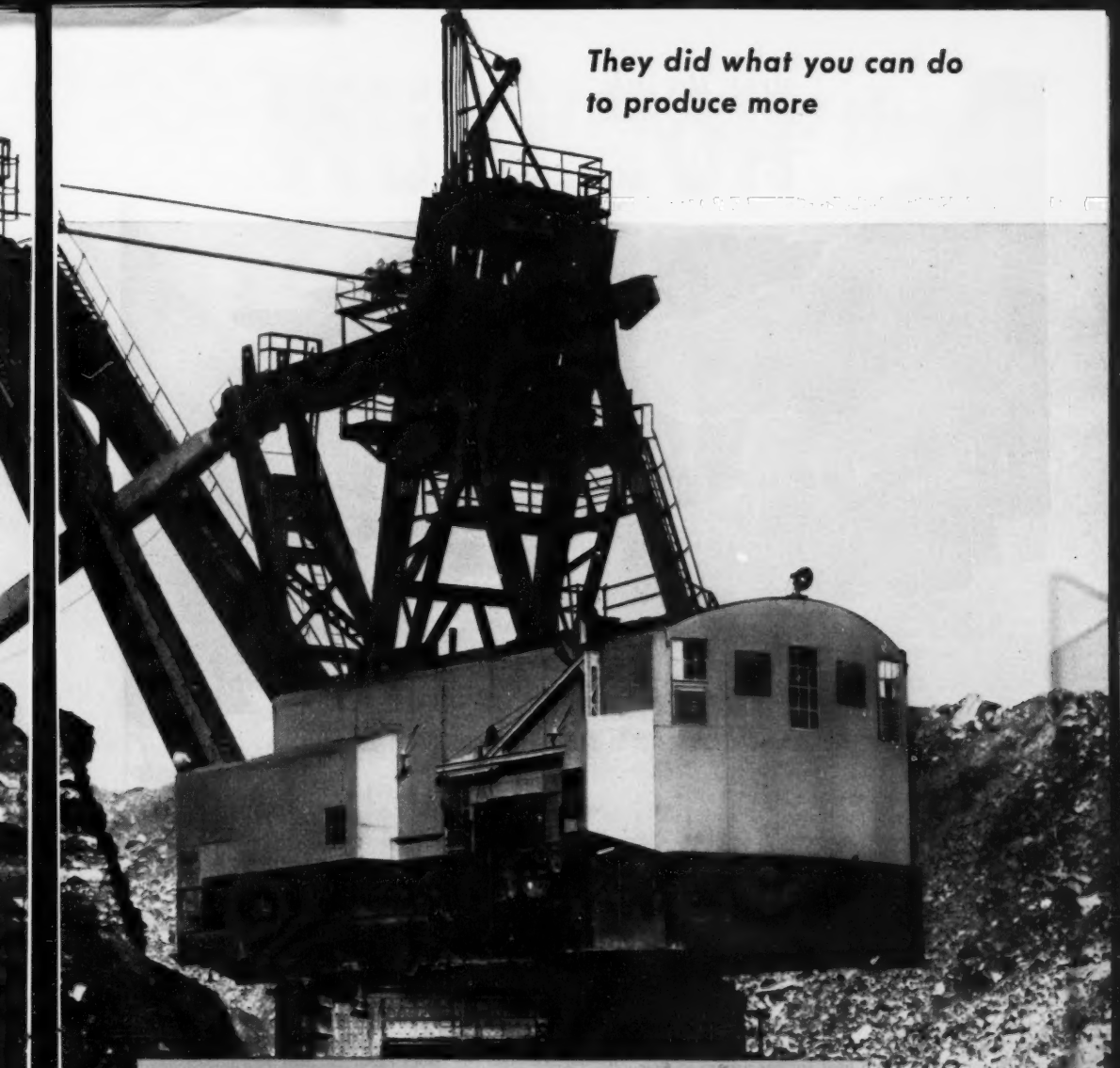
This is a good example of the performance Westinghouse builds into electrical equipment for mining. The next time you're planning a project, call in Westinghouse early. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-94879

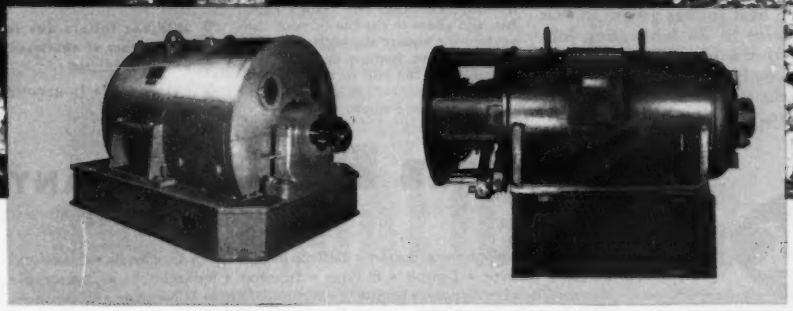
YOU CAN BE SURE...IF IT'S

**Westinghouse**

EQUIPMENT FOR THE MINING INDUSTRY

## *They did what you can do to produce more*





Westinghouse shovel motors are specially constructed to give you years of continuous operation even under the most rugged conditions. They are designed to help you get the most yardage out of your next shovel or dragline.

Rototrol is the master intelligence governing the shovel operation. It gives a quick, smooth responsive action to your operator's slightest control movement. This prevents shocks to equipment. The fast action cuts the digging cycle—speeds up production.

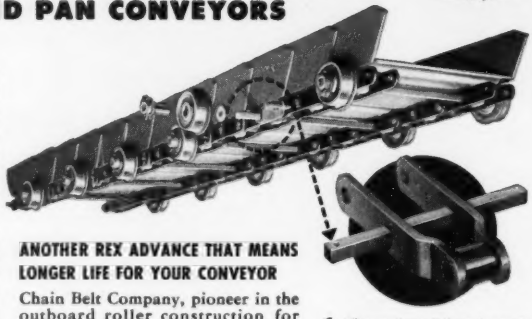
# HOT STUFF

## IS EASY WITH REX® APRON AND PAN CONVEYORS

When it comes to transporting hot bulk materials, there is virtually no upper limit to the temperatures the rugged, heavy-duty Rex Apron and Pan Conveyors can stand. Several now in operation are handling material up to 1900° F. Hot sinter, hot clinkers, hot lime, hot castings—these and many other "hot" items are all in a day's work with Rex Apron and Pan Conveyors.

Rex Conveyors will handle jobs where other types such as shaker conveyors and steel belts are useless. They have high capacity, require very little maintenance and operate at very low cost. Wearing parts are specially hardened. Chain is located away from high heat zone. Graphite impregnated grease is used throughout. When heat softens grease so that it flows, graphite remains to do lubricating job. With Rex, you are free from worry about premature failure and consequent costly down time or repairs.

For all the details write to Chain Belt Company, 4679 W. Greenfield Ave., Milwaukee 1, Wis.



**ANOTHER REX ADVANCE THAT MEANS LONGER LIFE FOR YOUR CONVEYOR**

Chain Belt Company, pioneer in the outboard roller construction for apron and pan conveyors, has now developed another new feature which can add years to the life of your conveyor—the square through rod. This exclusive Rex feature makes it impossible for the rod to rotate in the side plate. This means longer life for your conveyor *3 ways:*

1. **Through rod breakage is eliminated**
2. **Side bar failure due to enlargement of attachment holes is eliminated**
3. **Bushing life is greatly lengthened.**

CHAIN BELT REX COMPANY ®

# Chain Belt COMPANY
## OF MILWAUKEE

Atlanta • Birmingham • Boston • Buffalo • Chicago • Cincinnati • Cleveland
Dallas • Denver • Detroit • El Paso • Houston • Indianapolis • Jacksonville
Kansas City • Los Angeles • Louisville • Midland, Texas • Milwaukee • Minneapolis
New York • Philadelphia • Pittsburgh • Portland, Oregon • Springfield,
Mass. • St. Louis • Salt Lake City • San Francisco • Seattle • Tulsa • Worcester

***Distributors in all principal cities in the United States and abroad***

# AGITAIR is there!

## ... yielding maximum ORE RECOVERIES at lowest operating cost

This battery of Agitair Flotation cells is only a part of an operation in French Morocco that daily handles 4,000 tons of high grade lead-zinc ore.

Here, as in many other ore centers throughout the world, Agitair adapts to the local requirements of mill and metallurgy . . . yields maximum recovery at lowest operating cost . . . so efficient and ruggedly built that down-time is negligible.

What is your metallurgical problem? Galigher will gladly collaborate with you in finding the answer.

Your correspondence is invited.

***Leaders in Experience & Service***

# THE GALIGHER CO.

METALLURGICAL DIVISION — THE GALIGHER COMPANY — ENGINEERING SERVICE

**CONSULTATION • ORE TESTING**
**PLANT DESIGN • CONSTRUCTION**

Representing, GENERAL ENGINEERING CO. of CANADA, Ltd., U. S. A., MEXICO, SOUTH AMERICA

**HOME OFFICE**
545 West 8th South
Salt Lake City, Utah
P. O. Box 209

**EASTERN OFFICE**
921 Bergen Avenue
Jersey City, New Jersey

Agents In All Principal Foreign Mining Districts

***For small Pulp Volumes***

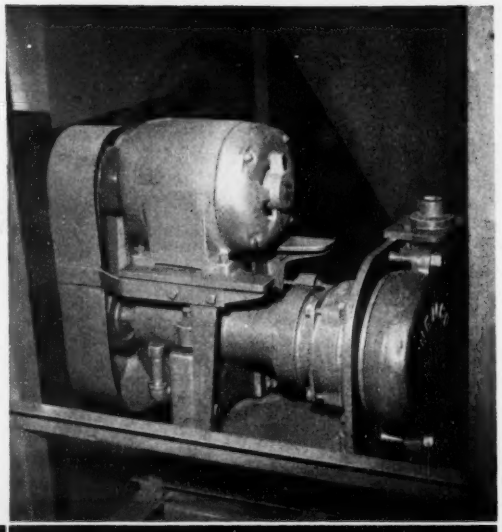
***use***

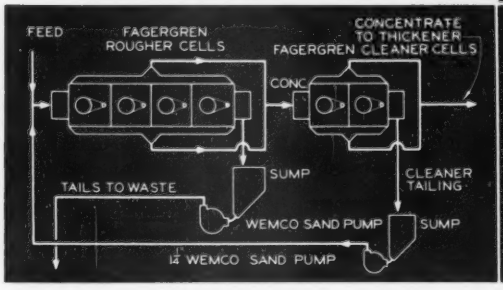
# WEMCO

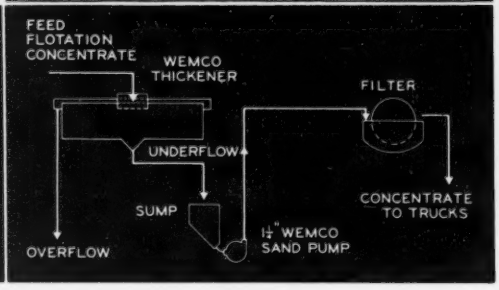
## 1¼" & 1½"

## SAND PUMPS

***compact—***
***light weight—***
***fits into small space—***






*The wide industry acceptance of* **WEMCO** *1¼" & 1½" Sand Pumps proves the value of these outstanding design features:*

- **Hard Alloys** in case, runner, follower plate and die ring minimize wear rate.
- **Centrifugal sealing** eliminates packing and sealing water and reduces running friction.
- **Left or right hand feed** may be set up by a simple 180° rotation of the intake.
- **Gravity intake** feeds directly to the impeller center to prevent intake sanding.
- **Welded steel base** is strong, non-breakable and light in weight.

**WEMCO** 1¼" & 1½" Sand Pumps are designed for pulp flow rates up to 100 gpm. They exactly fit the requirements of small mills, pilot plants and split circuits in larger flow plans. For **reliable** service on small pump volumes, specify **WEMCO** and be sure!

### SPECIFICATIONS

| PUMP SIZE | INTAKE DIAMETER | DISCHARGE DIAMETER | STD. RUNNER DIAM. | MAX. PARTICLE SIZE | REQ'D INTAKE HEAD | CAP. IN U.S. G.P.M. | HORSEPOWER AND RPM AT VARIOUS DISCHARGE HEADS. Horsepower at given capacity is for pumping clear water. For normal operations multiply this horsepower by the specific gravity of the pulp to obtain required horsepower for a given condition. | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 20' | | 30' | | 40' | | 50' | | 60' | |
| | | | | | | | RPM | HP | RPM | HP | RPM | HP | RPM | HP | RPM | HP |
| 1¼" | 2½" | 1¼" | 9" | ¼" | 2'-4" | 20 | 1055 | .7 | 1290 | 1.4 | 1475 | 1.9 | 1650 | 2.6 | | |
| | | | | | | 40 | 1080 | .8 | 1300 | 1.7 | 1495 | 2.0 | 1665 | 2.7 | | |
| | | | | | | 60 | 1115 | 1.0 | 1330 | 2.0 | 1520 | 2.2 | 1690 | 2.8 | | |
| 1½" | 2½" | 1½" | 9" | ¼" | 2'-4" | 80 | 1090 | 1.4 | 1300 | 2.1 | 1500 | 3.3 | 1675 | 4.8 | 1825 | 6.2 |
| | | | | | | 100 | 1120 | 1.6 | 1320 | 2.3 | 1530 | 3.4 | 1690 | 5.0 | 1840 | 6.4 |

OTHER **WEMCO** PRODUCTS

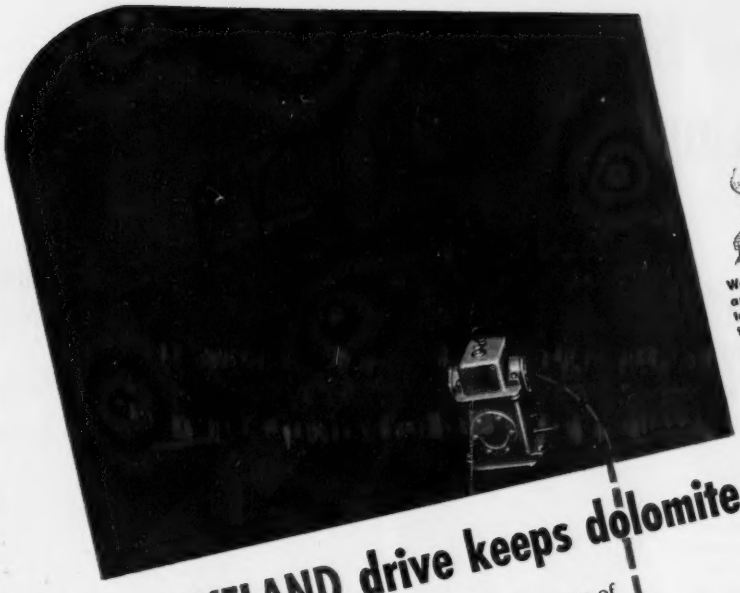
Mobil-Mills • Coal Spirals • HMS Thickeners
HMS Pumps • Densifiers • Cone Separators
Drum Separators • Fagergren & Steffensen Flotation Machines • Fagergren Laboratory Units
Hydroseparators • HMS Laboratory Units
Dewatering Spirals • Agitators • S-H Classifiers
Thickeners • Sand Pumps • Conditioners

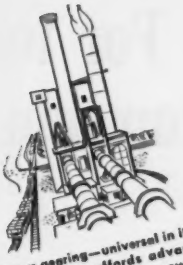
*Write today for descriptive bulletin No. P-15-1-1.*

**WEMCO**

**WESTERN MACHINERY COMPANY**

760-766 FOLSOM STREET · SAN FRANCISCO 7, CALIFORNIA





**Worm gearing—universal in its application—affords advantages for almost every power transmission job.**

*The Cleveland-driven conveyor shown here is feeding dolomite into a rotary kiln at the Basic Refractories Plant at Maple Grove, Ohio.*

# Steady CLEVELAND drive keeps dolomite rolling along

TO move sized, chemically-treated dolomite to one of its rotary kilns for uniform dead-burning, Basic Refractories, Inc., chose this dependable Cleveland. In service more than 10 years, it has operated steadily, day and night, most of that time.

Cleveland is the worm gear speed reducer which assures smooth uninterrupted top-peak production. Backed by 40 years of industrial know-how, Clevelands are found in hundreds of manufacturing plants, operating huge dryers and kilns, belt conveyors, bucket elevators, mixers and agitators, in fact, wherever a fool-proof horizontal or vertical drive is desired—wherever steady production is the key-word.

So whatever your needs, consult the helpful Cleveland engineer in or near your city and see how Cleveland drives can help keep your production schedules rolling. Write now for new Catalog 400. The Cleveland Worm and Gear Company, 3281 East 80th Street, Cleveland 4, Ohio.

*Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.*

**CLEVELAND**
Worm Gear
*Speed Reducers*

# For top belt-conveyor efficiency, top mining men rely on LINK-BELT

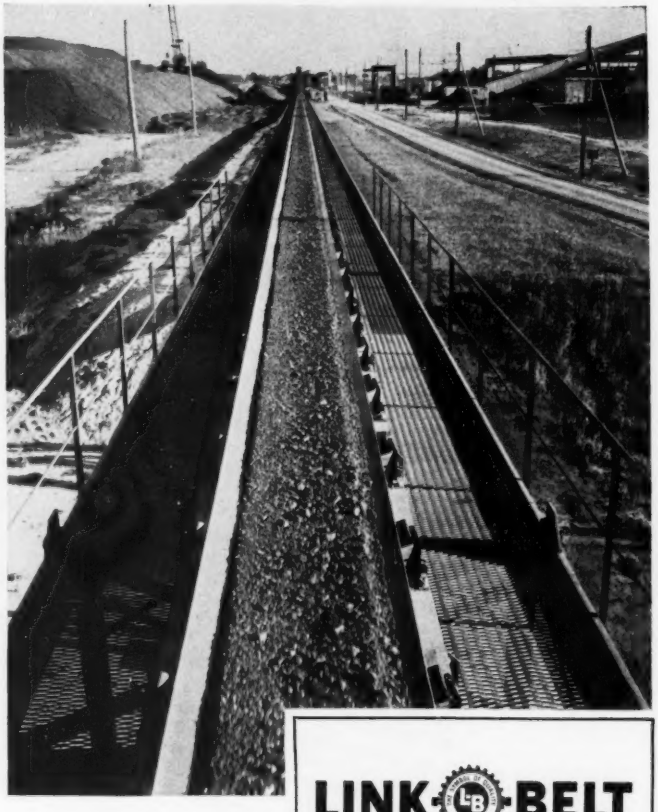
**LINK-BELT engineering experience plus quality components combine to cut handling costs**

Yes, in mines everywhere, Link-Belt is first choice in belt conveyors. Whether your job is large or small, Link-Belt can apply unequalled engineering experience to meet the conditions of your particular system.

Link-Belt builds a complete line of quality components. Our conveyor engineers can choose from all types and sizes of idlers, trippers and terminal machinery to match your exact requirements.

Link-Belt can also supply all related equipment — other types of conveyors, feeders, elevators, car dumpers and shakers. And Link-Belt will build your supporting structures and enclosures . . . install the job completely if desired.

Link-Belt will gladly work with your engineers or consultants. Get in touch with your nearest Link-Belt office.



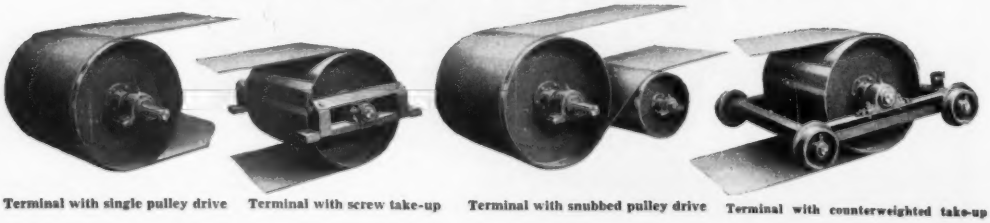
Ore can be delivered to stockpile at any point along this 940-ft. long L-B belt conveyor by means of motor-propelled tank-type tripper. Or it can pass directly over belt to smelter.

**LINK-BELT**
**BELT CONVEYOR EQUIPMENT**

**LINK-BELT COMPANY:** Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, Duluth, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa), Offices in Principal Cities.

12,747-C

**LINK-BELT Pre-Selected Terminals—the right equipment for every requirement**



Terminal with single pulley drive | Terminal with screw take-up | Terminal with snubbed pulley drive | Terminal with counterweighted take-up

# cut tonnage costs

with P&H ELECTRIC SHOVELS

In more and more locations these ultra-modern P&H machines are taking over the jobs that call for big production — steady digging. Users who know their cost accounting come back for more — for one proved reason . . . *lower tonnage costs.*

Contributing factors are these:

P&H Magnetorque* Hoist Drive powers hoisting motions electro-magnetically, gives you snappier dipper action — eliminates hoist generator, hoist motor, slip friction clutch and other troublesome mechanical devices.

P&H stepless power regulation is smooth and accurate — with no control fingers or contactors to give you trouble.

Independent propel, all-welded construction, filtered air cab and other modern refinements have led the way to more dependable production on a year-in, year-out basis.

If you seek lower tonnage costs in open pit work, let us tell you where you can see a P&H Electric Shovel in action. Ask about a P&H today.

*T.M. of Harnischfeger Corporation for electro-magnetic type clutch

*Every third P&H Electric Shovel sold is a repeat order*

**HARNISCHFEGER CORPORATION**

4454 West National Avenue • Milwaukee 14, Wisconsin

POWER SHOVELS • CRAWLER AND TRUCK CRANES • OVERHEAD CRANES • ARC WELDERS AND ELECTRODES • SOIL STABILIZERS • DIESEL ENGINES • PRE-FABRICATED HOMES

**IDENTIFICATION DISC:** An aluminum marking plate on all Walworth No. 225P's facilitates inventory control and makes reordering quick and positive.

# take a good look at the Walworth "500 Brinell" no. 225P Globe

**NEWLY DESIGNED HANDWHEEL:** Patented air-cooled, finger-fit handwheel affords sure grip even with greasy gloves.

## – the Toughest Bronze Valve Your Money Can Buy

The stainless steel, corrosion resistant seats and discs are heat treated to a hardness of 500 Brinell – hard enough to scratch glass and crush nails! The valve can be closed on sand, slag, and pipe scale without injury to the seating surfaces. "Wire drawing" is practically eliminated. All parts are accurately machined and gaged. Years of tight, positive shut-off are assured.

Available in both globe and angle types (angle type: No. 227P) in sizes ¼" to 2", this quality valve is recommended for 350 lbs. W.S.P. at 550 F, and 1000 lbs. non-shock service on cold water, oil, gas, or air.

For full data on this long-life, economical Walworth Bronze Valve, see your local Walworth distributor, or write for Circular.

**IMPROVED PACKING:** Molded packing of lubricated asbestos reinforced with copper wire. Suitable for practically every service. Valves can be repacked under pressure when fully opened.

## note these 7 Great Features

**HEXAGONAL UNION BONNET CONNECTION, DEEP STUFFING BOX AND RUGGED STUFFING NUT:** Union bonnet connection eliminates any chance of distortion or leakage even though valve is repeatedly taken apart and reassembled.

**OVERSIZE STEM:** The high-tensile strength silicon-bronze stem assures long life and protection against wear.

**SEATS AND DISCS:** Plug type seats and discs of stainless steel, heat-treated to 500 Brinell hardness and machined simultaneously to a mirror-like finish, with accurate tapers assures tight positive shut-off with minimum handwheel effort.

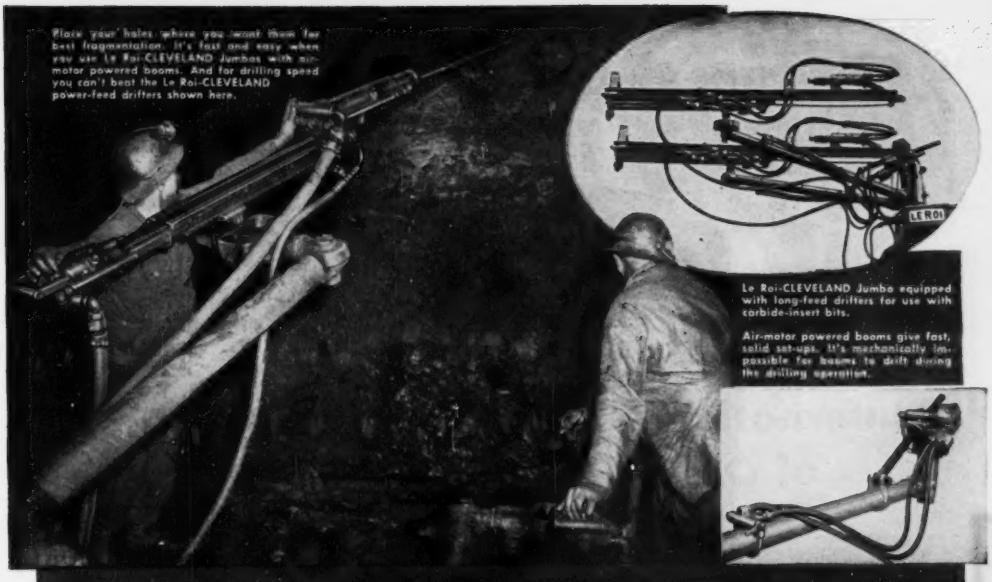
**EXTRA STRONG BODY:** Made of Composition M (ASTM B61) bronze. Thick walls and rugged hexes provide a high safety factor. Valves undergo hydrostatic shell test of 1,000 psi.

**WALWORTH**

**valves and fittings**

**60 EAST 42nd STREET, NEW YORK 17, N. Y.**

**DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD**


Place your holes where you want them for best fragmentation. It's fast and easy when you use Le Roi-CLEVELAND Jumbos with air-motor powered booms. And for drilling speed you can't beat the Le Roi-CLEVELAND power-feed drifters shown here.
LE ROI
Le Roi-CLEVELAND Jumbo equipped with long-feed drifters for use with carbide-insert bits.
Air-motor powered booms give fast, solid set-ups. It's mechanically impossible for booms to drift during the drilling operation.

# *Drilling-Cycle Time Reduced, Footage per Shift Increased*

## . . . when you use Le Roi-CLEVELAND Jumbos and power-feed drifters in your rock headings

THERE are three things you have to do if you want to save time in your drilling cycle and increase your footage — reduce set-up time, drill out the round faster, and shorten tear-down time.

You know this and so do we. That's why we designed the Le Roi-CLEVELAND jumbo the way it is. And that's also why our drifters drill so fast.

Let's see what you get when you use Le Roi-CLEVELAND:

★ The most flexible jumbo available. Air-motor powered booms let you space your holes quickly and easily for most efficient fragmentation.

★ Rigid, non-slip set-up feature keeps drifters in line, prevents steel binding, saves wear and tear on chucks, results in higher average drilling speeds.

★ Strong rotation, plus snappy yet powerful force of blow of Le Roi-CLEVELAND drifters gives you unexcelled drilling speed. This drilling speed coupled with the fast, positive feeding action of our power feed gives you the right pressure for fastest drilling and reduces drill-steel changing time.

You add all these advantages together when you use Le Roi-CLEVELAND jumbos and power-feed drifters. The outcome is faster drilling cycles, more footage per shift—so why not standardize on these cost-cutting honeys. Write for complete information.

**LE ROI COMPANY** RD-42

CLEVELAND ROCK DRILL DIVISION
12500 Berea Road, Cleveland 11, Ohio
Plants: Milwaukee, Cleveland and Greenville, Ohio

# Getting the Lead Out in a Tight Spot

## International TD-9s Each Load 39 Tons of Ore Hourly for Eagle-Picher

**FAST PASS.** International TD-9 takes a cubic yard bite of lead ore with Lodover shovel, backs to haul-truck and flips the load overhead into truck.

Three International TD-9s with Lodover shovels speed the loading of lead ore for Eagle-Picher Mining and Smelting Company. These fast-operating overhead shovel units work the underground passages in Eagle-Picher mines near Cardin, Oklahoma.

Average hourly production per unit has been 39 tons of lead ore into the haul-trucks for 516 consecutive working days.

This equipment combination saves time on any loading cycle for it operates without waste motion. The shovel's overhead loading action eliminates tractor turning and makes close-quarter operation practical.

Get full details on this and other money-making equipment combinations from your International Industrial Distributor today. You'll want to operate with International-powered machines from then on!

**INTERNATIONAL HARVESTER COMPANY**
**CHICAGO 1, ILLINOIS**

**INTERNATIONAL**

**POWER THAT PAYS**

INTERNATIONAL HARVESTER

**SEE YOU IN DENVER**

. . . at the Mining Show, Sept. 22 thru 25. Be sure to see the International Harvester exhibits.

## One too many

Short supply is a happy state of affairs when a woman buys a hat.

In industry, too often it is a sword that hangs over the buyer's head. Executives who order more than 85 per cent of all Multiwall bags overwhelmingly specify* on-schedule delivery as the factor to which they give greatest weight.

Union Multiwalls are shipped from the world's largest pulp-to-container mill.

The pulp from which they are made comes from forests Union owns or manages. Your supply of Union Multiwalls is unlikely ever to be restricted because of raw material shortages.

When and if allocations are necessary, you can count on receiving your fair share.

These are among the reasons why, since World War II, major buyers have given dependable Union so proportionately great an increase in their Multiwall orders.

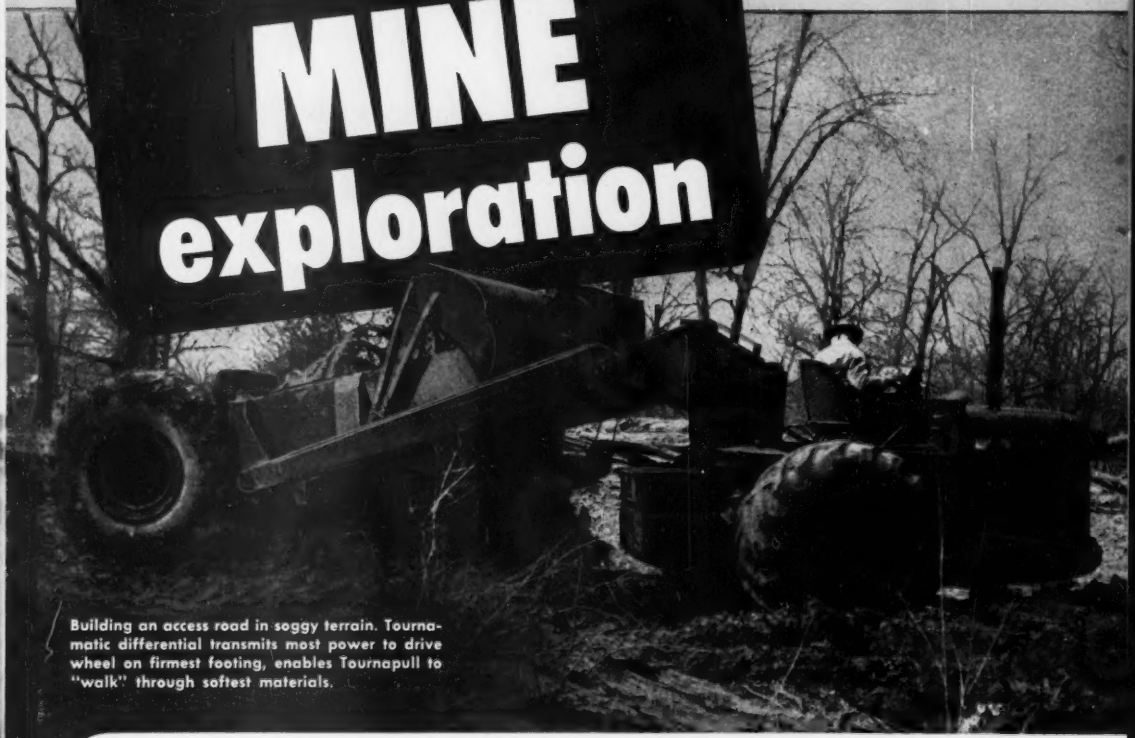
More so every day . . .

**IT'S UNION FOR MULTIWALLS**

*August, 1951 research study.

UNION BAG & PAPER CORPORATION • NEW YORK: WOOLWORTH BUILDING • CHICAGO: DAILY NEWS BUILDING

# Speed your MINE exploration with a



Building an access road in soggy terrain. Tournamatic differential transmits most power to drive wheel on firmest footing, enables Tournapull to "walk" through softest materials.

## The self-loading "D" handles

- Clears, levels sites for camps and drill set-ups. Eliminates cost of expensive cribbing.
- Strips surface material to expose bedrock. Gives you better access to formation.
- Builds, maintains and gravels access roads. Fills roads across soft, low areas.
- Loads, hauls material from open pits in 9-ton (7-yard) Carryall Scraper.
- Hauls in supplies. Carries loads over terrain no other wheeled vehicle can cross.
- Levels building sites. Digs sludge basins, drainage ditches and sluiceways.
- Moves into any site under its own power — over pavement or cross-country.
- Supplies electricity for emergency lighting or temporary equipment operation.

LE TOURNEAU
PEORIA, ILLINOIS

HIGH-SPEED UTILITY

TOURNAPULLS

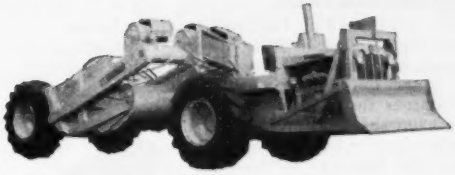
# versatile D Tournapull

Stripping overburden of sand, gravel and rock. Low-pressure tires give plenty of traction in the abrasive material. Special 36" wide-base sand tires are available for sand work.

The HIGH-SPEED, self-loading D Tournapull has the versatility needed to speed all the exploratory phases of your mine development. This job-proved unit moves in or around any location at speeds up to 28 m.p.h. It cuts grades accurately, hauls anywhere, and spreads in controlled layers. Its big tires effectively compact material. Where land restoration is required, the "D" is ideal for segregating topsoil, refilling and landscaping. Where ore-bearing soils are to be tested, the 122 h.p. "D" will self-load over 5 bank yards per trip for quick delivery to screens or hopper. Where dams or reservoirs are needed for water supply — ditches or sluiceways for drainage — the "D" moves in, gets the job done fast, and moves on to the next task without delay.

Big low-pressure tires, positive power steer and the unique Tournamatic differential enable Tournapulls to travel slippery saddleback roads or through deep mud and sand which would stall an ordinary truck. Electric scraper and steer controls and a foam-rubber seat give easy operation and easy riding in tough going. These are but a few of the reasons why this fast utility tool speeds search and pilot tasks, cuts costs, and eliminates many inconveniences of exploratory operation. It will pay you to learn more about what it can do for you.

## all these jobs:



Dozer blade available. One man can do clearing, build roads, drain, grade and strip.

Plows snow from supply roads. Self-loads, hauls snow, ice from camp sites.

Tournapull, Tournamatic, Carryall—Trademarks Reg. U.S. Pat. Off. DP-58-M

D Tournapull prime mover also powers

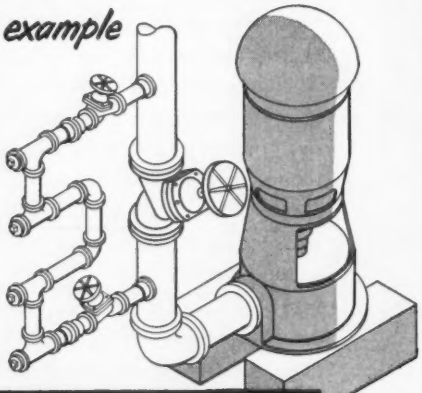
**9-TON REAR-DUMP**
Turns around in radius of 12'4", dumps load electrically.

**10-TON FLATBED**
Lifts load by means of traveling overhead hoist.

**10-TON CRANE**
Carries full load anywhere. No outriggers needed.

# How's This For Solving a Valve Problem ...on Corrosive Well Water,

*for example*



## THE INSTALLATION

On outlet of well water pump supplying plant of Barr Rubber Products Co., Sandusky, Ohio. Sulphur content of water extremely high.

## VALVE SERVICE RATINGS

| | |
|---|---|
| **SUITABILITY:** | Just what was needed |
| **MAINTENANCE COST:** | None to date |
| **CORROSION-RESISTANCE:** | No evidence of corrosion |
| **SERVICE LIFE:** | Outlasted any 2 other valves so far |
| **OPERATING RESULTS:** | Pump shutdowns for valve repairs stopped |
| **PRICE:** | Much less than alloy valves |
| **AVAILABILITY:** | Stock item in Crane line |

## THE HISTORY

Valves formerly used here lasted no more than 6 months. Under constant exposure to severe erosive and corrosive effects, they failed to provide the easy operation and positive seating needed in this service. They required excessively frequent re-packing and seating maintenance.

Problem solved by replacing with Crane Packless Iron Body Diaphragm valves in main line and by-pass. Installed more than a year, they show no corrosion, no effects of service. Operate smoothly, seat tightly, with no maintenance needed to date.

## THE VALVE

Crane No. 1611 Iron Body Packless Diaphragm Valves featuring separate disc and diaphragm. No packing to maintain; no stem leaks. Neoprene diaphragm used to seal bonnet only. Independent disc with neoprene insert insures positive seating even should diaphragm fail. Also fully neoprene lined valves. Many common and corrosive services. See your Crane Catalog or Crane Representative.

***The Complete Crane Line Meets All Valve Needs. That's Why,***
**More Crane Valves Are Used Than Any Other Make!**

# CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
*Branches and Wholesalers Serving All Industrial Areas*

***VALVES • FITTINGS • PIPE • PLUMBING • HEATING***

# OR TOUGH & TONNAGE

## *Homocord* CONVEYOR BE

"We pay more for Homocord, but it costs us less!" • That's what users say . . . and they won't take any other conveyor belt. It makes sense, too. Where tonnage is toughest, Homocord has been known to outlast 2 or 3 ordinary conveyor belts. Figure cost of belts, plus cost of repeated installations, and Homocord proves the biggest bargain you can get • Its special construction—cushioned and flexible—absorbs impact that other belts can't take. Send for Bulletin 6906 and read about the Guillotine Test that proves our point • The same engineering goes into our hose, V-belts and flat belts. Get your Manhattan representative to show you.

R/M

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

**RAYBESTOS-MANHATTAN, INC.**

Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Packings • Brake Linings • Brake Blocks Clutch Facings • Asbestos Textiles • Sintered Metal Parts • Bowling Balls

AGAIN— KENNEDY PRESENTS AN INNOVATION IN CRUSHING EQUIPMENT

# NEW

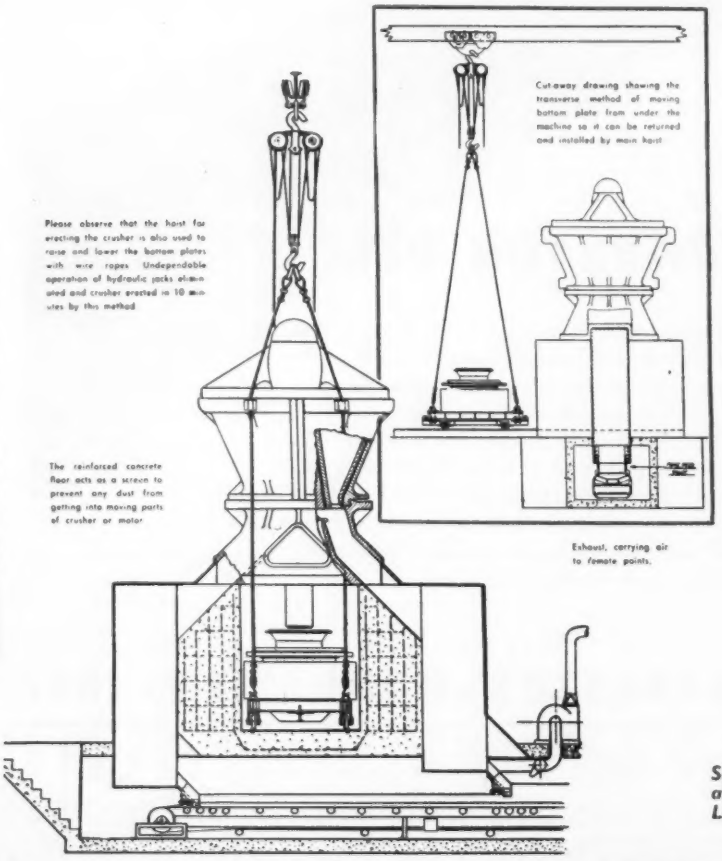
## Gyratory Crusher with Dual Discharge Outlets Increases Output and Efficiency

Only KENNEDY has the correct answer to the "Sticky Ore" problem! KENNEDY Gearless Gyratory Crushers are now built with TWO DISCHARGE OUTLETS plus an exclusive "No-Stick" feature that increases efficiency and output. This distinct innovation in crusher design is another "FIRST" for the world-famous line of KENNEDY crushing equipment.

Hard-to-crush rock and ore such as limestone, trap rock, basalt, taconite, slag, etc., containing as high as 50% clay, can be handled without sticking or clogging by the exclusive KVS process.

No other crusher offers this advantage. Double discharge outlets, built at angle of 70 degrees, assure uninterrupted delivery of material. Other crushers, with single 42 degree outlets, cannot compare because the discharge outlet becomes clogged with sticky clay or taconite ore.

In the new KVS crushers, rock and ore pass through mantle and concaves at bottom. A vertical drop of 6 feet then quickly and surely disgorges sticky clay, etc.—greatly speeds production by eliminating clogging—saves countless man hours clearing stalled crushers.


Cut-away drawing showing the transverse method of moving bottom plate from under the machine so it can be returned and installed by main hoist
Please observe that the hoist for erecting the crusher is also used to raise and lower the bottom plates with wire ropes. Undependable operation of hydraulic jacks eliminated and crusher erected in 10 minutes by this method
The reinforced concrete floor acts as a screen to prevent any dust from getting into moving parts of crusher or motor
Exhaust, carrying air to remote points.

## CHECK THESE FEATURES!

**Synchronous motor built into pulley assembly**

**Smooth frictionless operation because the crusher is gearless**

**Power used ONLY for crushing**

**All moving parts carried on self-aligning roller bearings**

**KVS forced-feed oiling system pumps four barrels of oil per hour through bearings without waste**

**Eccentric and ball are spray babbited. NONE has been rebabbited in over three years**

*Send for bulletins describing all types of KVS crushers. Let us prove that "It Costs Less To Own The Best".*

# Machinery and Equipment *in use the world over!*

Experience gained in almost a half-century of designing, engineering and manufacturing machinery, used in leading plants the world over, is reflected in the dependability and economy of operation which distinguishes all K V S products. Flow charts and maintenance records compiled in the operation of many different plants equipped with KVS machinery and equipment show an unvarying *decrease* in production costs and a uniform *increase* in output.

The KVS plant at Danville, Pa., provides unrivalled manufacturing facilities. Over 20 acres of floor space under the cranes, equipped with the most modern machinery and engineering facilities in the world, is devoted exclusively to the manufacture of crushing and mining equipment for Lime and Cement plants plus steam generating plants designed to provide maximum power for processing a wide variety of materials and products.

Gyratory crushers (Double Discharge Outlets) Primary & Secondary

Swing Jaw Crushers (Jaws reversible, end-to-end)

Slugger Rolls (Available in single roll models)

Stratified Air Swept Tube Mills

Preheaters, Soaking pits, Deheaters

Rotary kilns, Coolers, Dryers (sectional lengths & diameters)

Rod, Ball & Tube Mills

Vibrating Screens (One, Two or Three decks)

Heavy-Duty Rock Feeders (Kennedy Overlapping Pans)

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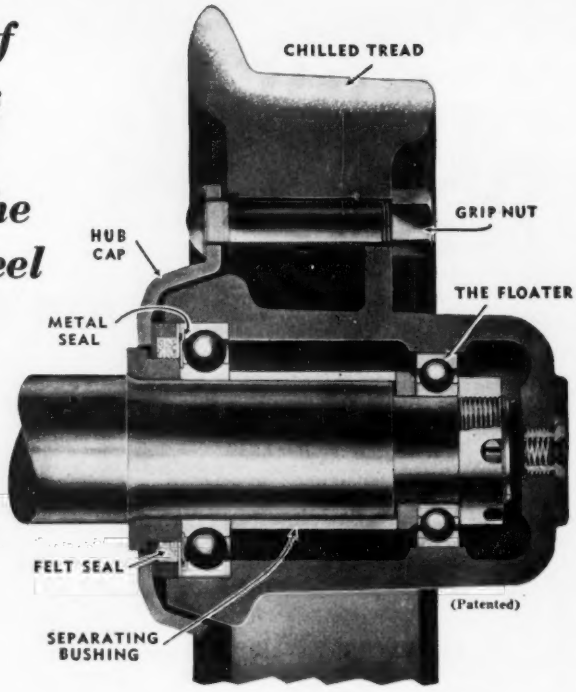
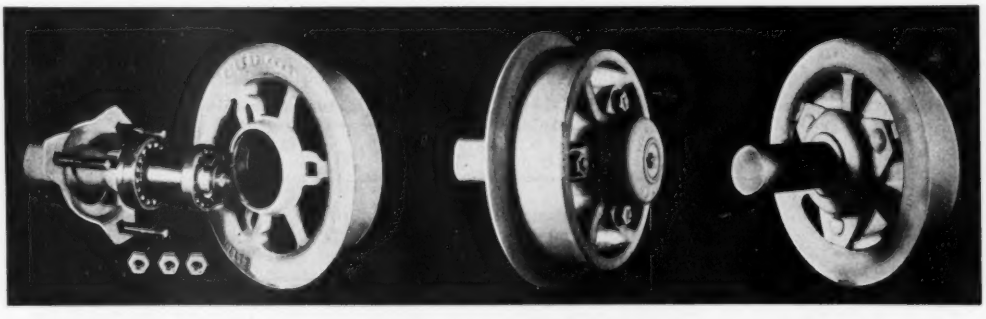
# *The Big Cause of Bearing Failures Was Eliminated When We Built the S-D "Floater" Wheel*




**There are never any loose or tight bearings on S-D "Floater" Ball Bearing Wheels. One of the two bearings "floats" into position, causing both bearings to stay automatically in perfect adjustment. This is one of the important reasons why you will have less breakdowns when your mine cars are equipped with S-D "Floater" Wheels! The magic "floating" bearing automatically adjusts itself when wheel is mounted and the three retaining bolts are pulled up tight. The extra large bearing absorbs all side thrusts and carries the bulk of the load. Any workman on the job can remove and replace a S-D "Floater" Wheel because "Floater" bearings always remain in perfect adjustment on the axle whether the wheel is off or on. Remember, too, that S-D "Floaters" have solid front hubs and positive back seals to keep foreign matter out and grease in! The low cost operation of S-D "Floater" Wheels is certainly worth investigating. Write today for complete information! Sanford-Day Iron Works, Knoxville, Tenn.**



**SANFORD-DAY IRON WORKS**

KNOXVILLE
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# QUICK, EASY DISASSEMBLY MEANS

# Low Service Cost

**1.** Disconnect drive, loosen casing bolts and lift bolt assembly from slot. Bolt, nut and washers are still connected for easy reassembly.

**2.** Swing out rotating element. Neither suction nor discharge piping is disturbed. All wearing parts are fully accessible for inspection or servicing.

## Back in Service in less than a Half Hour

**ALLIS-CHALMERS**

Coal Washing Pump

**Only 5 Wearing Parts**

**Shaft sleeve, impeller, casing, two wear plates. All easy to handle and easy to replace.**

YOU CAN SEE for yourself how quick and easy it is to service an Allis-Chalmers Solids Handling Pump. Fast servicing like this plus long runs between servicing keeps your pumping costs low.

You get long life from Allis-Chalmers Coal Washing Pumps, too, because they are made of special hard *Allisite* alloy . . . because they have thick sections and heavy parts throughout . . . and because they are application engineered by specialists who know coal washing problems and how to solve them. Allis-Chalmers can supply the complete pumping unit — pump, motor, drive and control — of matched components from one reliable source with one guarantee of satisfaction.

Get complete information on Allis-Chalmers Solids Handling Pumps from your nearest Allis-Chalmers Authorized Distributor or District Office. Or write Allis-Chalmers, Milwaukee 1, Wisconsin, asking for Bulletin 08B6381. A-3781

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**ALLIS-CHALMERS**

# Here's the time-proved torque converter for heavy service

## —a compact, efficient torque converter and fluid coupling available for heavy-duty engine and equipment manufacturers

ALLISON—builder of more than 10,000 Torqmatic Transmissions for military vehicles—offers American industry this proved torque converter. It enables heavy-duty equipment to get more work done faster—with less wear and tear on equipment and less operator fatigue.

*A combination torque converter and fluid coupling,* the new Allison TORQMATIC CONVERTER gives heavy off-highway trucks and other power machinery the smoothness and operating ease you enjoy with a hydraulic transmission in your car. It makes practical multiple engine installations in heavy vehicles.

The TORQMATIC CONVERTER multiplies torque automatically, providing an efficient balance between engine power and changing load demands. This eliminates engine lugging and stalling — permits the engine to operate in its most effective speed range.

It also prevents shock-loading of drivelines, cables, shafts, chains, gears and axles—reduces maintenance—lengthens equipment life.

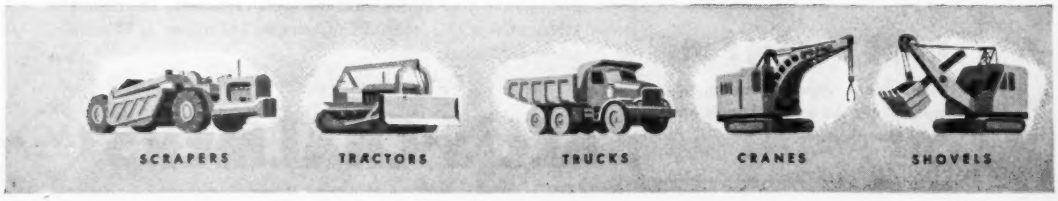
### *Wide Flexibility*

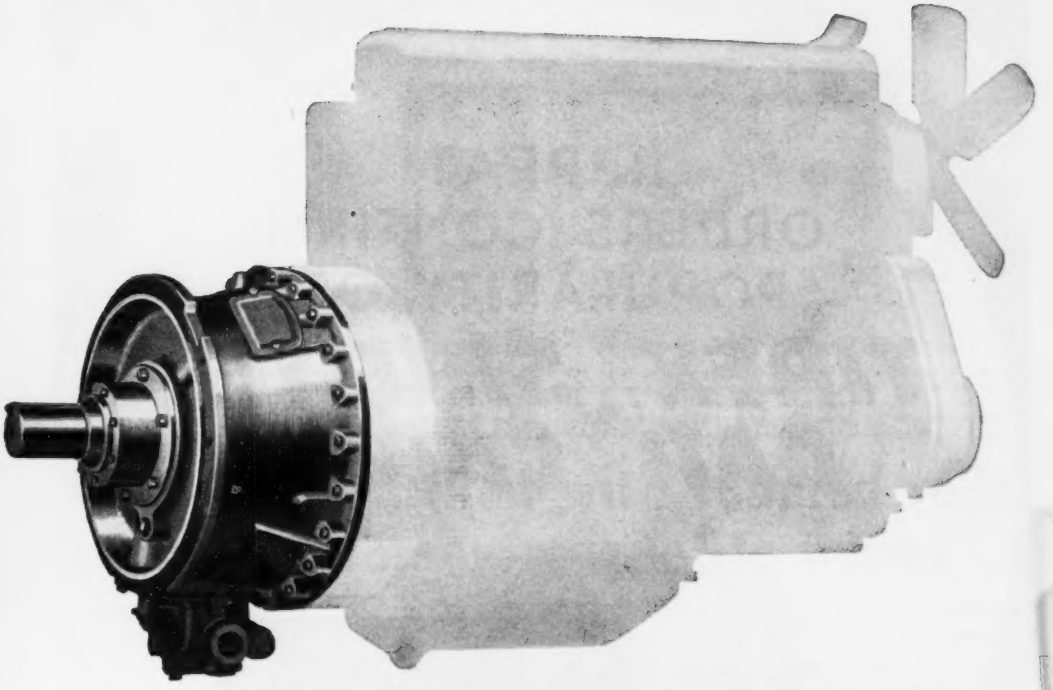
Allison TORQMATIC CONVERTERS have been applied successfully with many engines in a variety of heavy-duty equipment — trucks, tractors, earth movers, industrial locomotives, rail cars, hoisting machinery, logging equipment, drilling rigs and pumps.

In each of these applications, the TORQMATIC CONVERTER has proved its ability to get the most work done in the shortest possible time.

Allison TORQMATIC CONVERTERS furnish ideal drives for heavy-duty engines delivering 75 to 350 horsepower. These compact units take no more space than a conventional, clutch-type, power take-off. For further information write to:

ALLISON DIVISION of GENERAL MOTORS
Box 894M, Indianapolis 6, Indiana





## Here's how Allison Torqmatic Drive pays off:

**More work output**—eliminates "gearshift guess," multiplies torque hydraulically. Automatically balances engine power with changes in load demand.

**Handles heavy loads**—with shock-free, pinpoint control.

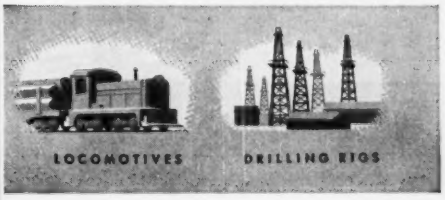
**Longer equipment life**—increases life of drivelines, axles, chains, sprockets and gears. Reduced wear and tear on equipment means higher availability.

**Longer engine life**—no engine lugging or stalling—reduces shock-loading on engine and components.

**Few moving parts**—simplified design with one-piece cast converter elements—easy to maintain.

**Compact design**—simplifies installation.

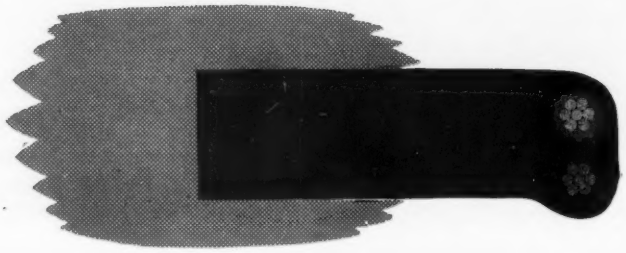
- Designed for power application from 75 to 350 h.p.
- Wide variety of models including industrial shafts, automotive type flanges, dis-connect clutches, lock-up clutches, output shaft governor drive.




GM GENERAL MOTORS

Allison
TORQMATIC DRIVES

# REPEAT ORDERS CONFIRM POPULARITY OF TIREX SHUTTLE CAR CABLE



Simplex-TIREX Shuttle Car Cable with the unusual "geared" design is barely more than two years old, yet it has already achieved widespread popularity.

The reason for this unusual popularity is not dificult to find. It is told in repeat orders and in letters from enthusiastic customers. Repeat orders, of themselves, are the finest testimonial any product can receive.

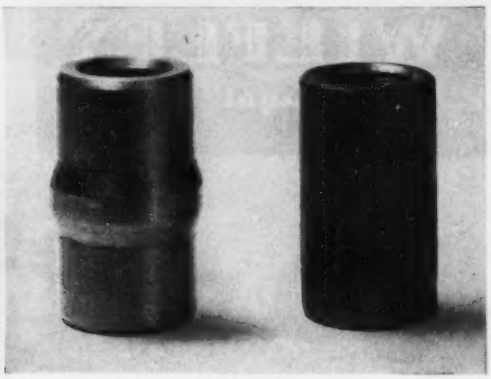
The letters explain why customers are buying Simplex-TIREX Shuttle Car Cable to the exclusion of all other types for shuttle car and mining machine service. The reasons given are many and varied but they all add up to the same conclusion. TIREX Shuttle Car Cable gives longer life under more rugged conditions and will haul more tons of coal per dollar of cable cost. That's a darn good reason for anybody to buy a product.

Have you tried Simplex-TIREX Shuttle Car and Mining Machine Cable yet for your "buggies"? If you haven't, you can get it from your mine supply house.

Simplex - WIRES & CABLES

SIMPLEX WIRE & CABLE CO.
79 SIDNEY STREET,
CAMBRIDGE 39, MASS.

Ralph J. Catanzarita (left), drill-steel-shop foreman at Scrub Oaks Mine, discusses his patented drilling tools with T. M. Leisenring, Bethlehem salesman. The short rods are coupled to demonstrate positions of the bit, bit adapter, extension-rod coupling, and reducer coupling. Note water tube inserted in the ring-sealed shank.



The use of Omega tool steel (a Bethlehem shock-resisting grade) has reduced coupling failures to about one in 500; and there has not been one case of stripped threads. The coupling at left is unused. The one at the right has been used in drilling 1700 ft. Note how the outside wearing surfaces have been worn down by the abrasive rock.

# Deep holes drilled with coupled rods in New Jersey magnetite mines

Coupled rods of Bethlehem Hollow Drill Steel are used regularly in drilling holes from 35 to 135 ft deep at the Scrub Oaks and Oxford Mines, both located in the historic magnetite belt of northern New Jersey. Holes more than 150 ft deep have been drilled on several occasions. Both mines report substantial savings in time, powder, and overall drilling costs as compared with previous drilling practice.

Hollow drill steel, 1¼-in. round, with ring-sealed shanks, are the "drive rods"—usually in lengths of 4½ and 8½ ft. After a hole is started with the two lengths of drive rods, an 8½-ft extension rod of 1-in. hexagon steel is attached to the shorter drive rod by means of a reducer coupling. On the end of this extension rod a bit-adapter is attached, and a carbide-insert bit is fitted to the adapter. The bit adapter serves as a bearing and helps to keep the string of rods from wandering out of line; it also pulverizes the cuttings for easy hole-cleaning. As drilling progresses, other extension rods of 8½-ft length are added, through the use of a unique coupling.

Drifter drills are securely mounted and fitted with an air-and-water valve for efficient hole-cleaning; extra-long water tubes are used. Various other modifications of normal drilling practice are used at these mines to insure best results on long holes.

Here's enough drill steel to drill a 100-ft hole. The ten extension rods of 1-in. hexagon, 8½-ft long, are threaded at both ends. Two drive rods, nearest camera, are 1¼-in. round. A 3-in. bit and a bit adapter are shown attached to the shorter drive rod, although in actual drilling these are attached to the leading extension rod.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation
*Export Distributor:* Bethlehem Steel Export Corporation

## Bethlehem Hollow Drill Steel

# WILFLEY
centrifugal PUMPS

# 30 acres 2 miles

• ***Wilfley Special High Head Sand Pumps*** play an important role in the successful reclamation program of the Hawaiian Commercial & Sugar Co.

• Each year, at the Puunene Mill, 30 to 40 acres of useless, sandy waste land are transformed into productive ground for sugar cane cultivation.

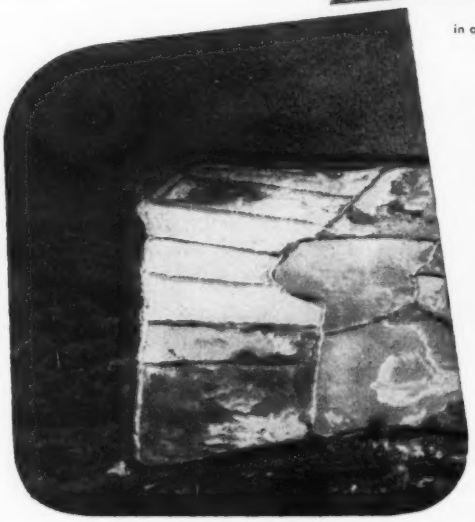
• Soil, removed from mechanically harvested cane by washers, is settled to a sludge of 15% to 25% solids. This sludge, together with a sludge of repulped filter cake, is pumped to the diked waste area. When dry, there remains a 2 to 3-ft. layer of reclaimed cultivable topsoil over the coral sands.

• WILFLEY Pumps, operating on a 24 hour-a-day, trouble-free schedule perform the tremendous task of delivering 300- 500 G.P.M. of cane washer wastes through 2 miles of 6" pipeline to the reclamation area. As a result, wastes which formerly presented a costly disposal problem, are now converted into revenue-producing land.

Wilfley Special High Head Pumps in operation at the Puunene Mill of the Hawaiian Commercial & Sugar Co

*Buy rugged, heavy-duty Wilfley Pumps* whenever the job calls for the efficient and economical handling of sludges, slimes, slurries or sands. The new WILFLEY Model "K" Centrifugal Sand Pump, embodying many important mechanical improvements, delivers higher efficiencies, stepped-up production, worthwhile power savings and lower operating costs. Easy interchangeability of wear parts. Low maintenance costs. Every application individually engineered. Write or wire for complete details.

**A. R. Wilfley & Sons, Inc.**
Denver, Colorado, U.S.A.
New York Office: 1775 Broadway, New York City



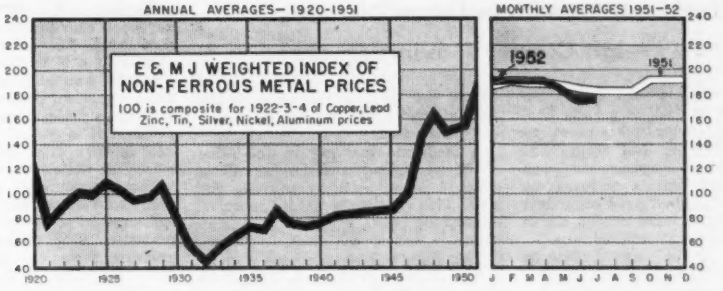
Buy WILFLEY for cost saving performance

Companion to the famous WILFLEY Acid Pump

Upper: Reclaimed land under cultivation
Center: Diked reclamation area
Bottom: Waste land to be reclaimed

# E&MJ OUTLOOK

**PRICES**




**MARKETS**

**Despite a recession** in general industrial activity caused by the steel strike (settled late in July), major nonferrous metals did well right along, and promise to do even better in August.

**The *E&MJ* index** of nonferrous metal prices rose to 179.79 in July from the June mark of 179.18. A drop in zinc was nullified by a rise in lead and foreign silver.

**Scramble for bargain-counter domestic copper** continued, and consumers also snapped up big tonnages of 36½¢ foreign copper. This hectic buying, sparked by a fear of a strike in copper mines, is almost certain to ease off this fall, especially if the strike doesn't materialize.

•

**LABOR**

**A strike in copper** isn't inevitable, unless Mine, Mill insists on its 25¢ wage increase demand. The Wage Stabilization Board and John Steelman will both okay reasonable wage and price increases. There's hope that the wage negotiations can be kept out of Washington this time.

•

**AT HOME**

**With the government easing credit,** and with hard goods shortages developing out of the steel strike, more inflation might seem in prospect. It's more likely that business will stay at a high level through this year, but without much price inflation. Consumers are still not buying.

**Watch our next month's issue** for news of a new, high output shovel for use underground.

**Calumet & Hecla** will spend $6-million to unwater their Osceola mine in Michigan under a DMPA contract for 7,000 tons of copper yearly.

**The U. S. can't wait** for that low-cost titanium process. That's why DuPont gets help on a $15-million titanium metal plant now.

**You'll probably see a U. S. gold mining company** in the uranium business before long.

**Tintic Standard** has a third interest, with Utah Construction Co. and Foley Brothers, both contractors, in a venture to treat **Cuyuna Range iron-manganese ores** by Chemico's new leach-precipitation process.

**Favorite indoor sport in Arizona** just now is guessing what mining, and treatment costs, plus debt service, will be at San Manuel. We don't know either, but we do know Magma knows what it's doing.

•

**ABROAD**

**New uranium plants,** using processes like those used in Colorado Plateau mills, are about ready in South Africa. Largely U. S.-financed, they'll send most of their output to the United States.

**Fighting to regain** their one-time dominant position in international trade in commodities, the British are determined to restore free trading in lead by October. If it works, they'll open up on zinc and finally copper.

# MARKETS—Trends and Prices

## End of Steel and Aluminum Labor Disputes Lifts Costs—Foreign Copper Moving Freely

THE COSTLY STEEL STRIKE, settled on July 24 after 53 days of greatly curtailed production, caused general industrial activity to fall throughout July. However, excepting zinc and tin, nonferrous metals suffered no serious setback. Steel production lost to the country because of the strike was estimated at 17-million tons.

Settlement of the wage dispute in steel has set off another wave of price inflation. The agreement provides for a wage increase of 16¢ an hour, fringe benefits of about 5.4¢ an hour, and a modified union shop. Against this, producers have been granted a $5.20 a ton increase in the price of carbon steel.

Soon after the steel agreement was announced, the Aluminum Company of America and the CIO also signed an accord along the lines established in steel. Before the Alcoa agreement was concluded, Alcoa and Reynolds declared that price relief would be essential to offset higher costs. They asked for a 2¢ rise in primary aluminum. Kaiser said it must have a 2.35¢ boost. As July ended, officials of OPS indicated that the price of primary metal will be raised by only 1¢.

These developments in the field of labor were highly important to all producers of nonferrous metals. They virtually set a pattern for the negotiations now in progress. Tension over a possible work stoppage at mines, mills and smelters eased considerably late in the month. The threat of work stoppages sustained business throughout the month, particularly in copper. This "fear" buying absorbed all of the high-priced foreign electrolytic copper that was available.

### Toward Free Markets?

Traders believe that the trend now favors a return to free markets. The British Government has decided that private trading in lead in the U. K. should be restored as soon as the necessary arrangements could be made, probably by October 1 this year. NPA has amended Order M-8 permitting the resumption of private importations of tin. Allocation of tin in the U. S. will be continued on either a monthly or quarterly basis, whichever method is desirable. The RFC will continue to make tin available at $1.21½, which, in effect, establishes a ceiling at that level. Long-term agreements with the government will be continued. The move points to further relaxation of tin control. However, NPA officials warned that quick decontrol of the metal is unlikely.

The improved supply situation caused the NPA to further ease the restrictions on the end use of copper in construction.

A moderate recovery in the price of domestic lead and foreign silver offset a lower monthly average for zinc. This caused the *E&MJ* index of nonferrous metal prices to rise from 179.18 in June to 179.79 in July.

The Federal Reserve Board's index of industrial production for June dropped to 203% of the 1935-39 average, which compares with 211% (revised) in May and 221% in June last year. The steel stoppage caused the sharp dip in June. Preliminary estimates for July indicate that the index may settle around 193%. During August, however, industrial production is certain to move upward, following the trend in steel.

OPS promised price relief for manganese (electrolytic) and ferromanganese because of higher costs of manganese ore.

### Copper Still Active

U. S. consumers purchased domestic and foreign copper at a lively pace, and the higher price obtaining on the imported metal was paid without any apparent opposition. The threat of labor difficulties, which could cut down production, undoubtedly was a factor in stimulating business. Once this threat is removed the buying should moderate, market authorities hold. Domestic copper at 24½¢ is relatively cheap. Under the 60% domestic and 40% foreign purchasing program the domestic fabricator is paying no more than 29½¢ for copper, assuming he is taking full advantage of the tonnages allotted to him. Foreign consumers are paying several cents above this average.

NPA has allocated 72,467 tons of domestic copper and 62,785 tons of foreign copper to U. S. consumers for August. This compares with 80,000 tons of domestic and 53,333 tons of foreign in July. A reduction in domestic output is expected by NPA in August.

Fabricators in this country shipped products in June that contained 107,709 tons of copper. This compares with 109,890 tons moved in May and 129,283 tons in June last year. Fabricators' stocks of refined copper as June ended totaled 245,750 tons, against 237,808 tons a year ago.

### Foreign Copper Quotations

Producers of foreign copper remained far apart in their views on what constitutes a fair quotation under prevailing conditions. The Chilean authorities held to 35½¢, f.a.s. Chilean ports and sold substantial tonnages at that level. The Rhodesians held to 33.694¢ f.a.s. N.Y. equivalent throughout July, and Katanga moved up to 33.5¢. Canadian producers sold copper at various prices, depending on destination, but in general the prices realized in that area were under those named in Chile.

The government purchased well over one-half of the 30,000 tons of lead earmarked for its civilian-defense stockpile. This removed all selling pressure from the market and the price ruled firm at 16¢ N.Y. throughout July.

President Truman signed the order that reimposed the duty on zinc of 6/10¢ per pound for metal contained in ore and 7/10¢ for slab zinc on

### Average Prices for July (E&MJ Quotations)

| | |
|---|---|
| **Copper:** | |
| Electrolytic, domestic, refinery | 24.200 |
| Electrolytic, export, refinery | 34.815 |
| **Lead:** | |
| Common, New York | 16.000 |
| Common, St. Louis | 15.800 |
| **Silver and Sterling Exchange:** | |
| Silver, New York, per oz. | 82.886 |
| Silver, London, pence per oz. | 72.609 |
| Sterling Exchange, "Checks" | 278.827 |
| **Zinc:** | |
| Prime Western, East St. Louis | 15.000 |
| **Tin:** | |
| New York Straits | 121.500 |
| New York, 99% min. (e) | 120.500 |
| **Gold**, per oz. U.S. price | $35.000 |
| **Quicksilver**, per flask | $189.808 |
| **Antimony** (E&MJ) (d) | 42.470 |
| **Antimony**, bulk, Laredo | 39.000 |
| **Antimony**, in cases, Laredo | 39.500 |
| **Platinum**, refined, per oz. | 90.000 |
| **Cadmium** (a) | 225.000 |
| **Cadmium** (b) | 232.500 |
| **Cadmium** (c) | 240.000 |
| **Aluminum**, 99% plus, ingot | 19.000 |
| **Magnesium**, ingot | 24.500 |
| **Nickel** (f) | 56.500 |

Domestic quotations, unless otherwise stated, are in cents per pound. Sterling exchange checks, in cents. Quicksilver, per flask of 76 lbs.

(a) Cadmium average based on the producers' quotation.

(b) Cadmium average based on the average of the producers' and platers' quotation.

(c) Cadmium average based on platers' quotation.

(d) Domestic, 5 tons or more but less than carload lot, packed in cases, f.o.b. New York.

(e) Tin content.

(f) F.o.b. Port Colborne, U.S. duty included.

July 23. This brought the duty into play on the following day. Stocks of slab zinc in producers' hands increased from 32,946 tons on hand at the end of May to 63,031 tons a month later.

Production of primary aluminum in June totaled 77,476 tons, making the six-months' output in this country 461,536 tons, an increase of 14½% over the same period last year. Total output in June met with a setback because of storm damage at the plant in Massena, N.Y.

(*Markets continued on page 110*)

## "Free" Gold Market

Though the volume of business in the free gold market declined from approximately $130-million in June to $105-million in July, prices realized were higher. Renewed unsettlement in currencies was noted. Buying orders for the Near East and Far East increased; European business moderated. "Pick's World Currency Report" quotes on prices, per fine ounce, as follows:

| | COINS | | BARS (12.5 kg.) | |
|---|---|---|---|---|
| | June 30 | July 31 | June 30 | July 31 |
| NEW YORK, transit | ..... | ..... | $37.40 | $37.75 |
| MANILA | $48.25 | $48.75 | 39.50 | 38.50 |
| HONG KONG | 47.50 | 47.75 | 40.00 | 40.40 |
| BOMBAY | 49.50 | 49.75 | 43.50 | 45.00 |
| TANGIER | 50.90 | 51.00 | 37.40 | 37.75 |
| BEYROUTH | 50.25 | 50.20 | 37.45 | 37.85 |
| PARIS | 53.00 | 53.50 | 39.00 | 39.35 |
| BUENOS AIRES | 47.50 | 46.00 | 40.00 | 41.00 |

## Major Metals

### U. S. DAILY AND AVERAGE PRICES

| July 1952 | Electrolytic Copper (a) Domestic | Electrolytic Copper (b) Export | Straits Tin New York | Lead New York | Lead St. Louis | Zinc East St. Louis |
|---|---|---|---|---|---|---|
| 1 | 24.200 | 36.075 | 121.500 | 16.000 | 15.800 | 15.000 |
| 2 | 24.200 | 35.975 | 121.500 | 16.000 | 15.800 | 15.000 |
| 3 | 24.200 | 33.075 | 121.500 | 16.000 | 15.800 | 15.000 |
| 4 | Holiday | 33.850 | Holiday | Holiday | Holiday | Holiday |
| 5 | No Market | 34.480 | 121.500 | 16.000 | 15.800 | 15.000 |
| 7 | 24.200 | 34.755 | 121.500 | 16.000 | 15.800 | 15.000 |
| 8 | 24.200 | 34.330 | 121.500 | 16.000 | 15.800 | 15.000 |
| 9 | 24.200 | 34.850 | 121.500 | 16.000 | 15.800 | 15.000 |
| 10 | 24.200 | 34.200 | 121.500 | 16.000 | 15.800 | 15.000 |
| 11 | 24.200 | 35.000 | 121.500 | 16.000 | 15.800 | 15.000 |
| 12 | No Market | 33.875 | 121.500 | 16.000 | 15.800 | 15.000 |
| 14 | 24.200 | 35.300 | 121.500 | 16.000 | 15.800 | 15.000 |
| 15 | 24.200 | 34.900 | 121.500 | 16.000 | 15.800 | 15.000 |
| 16 | 24.200 | 33.925 | 121.500 | 16.000 | 15.800 | 15.000 |
| 17 | 24.200 | 34.350 | 121.500 | 16.000 | 15.800 | 15.000 |
| 18 | 24.200 | 35.225 | 121.500 | 16.000 | 15.800 | 15.000 |
| 19 | No Market | 34.000 | 121.500 | 16.000 | 15.800 | 15.000 |
| 21 | 24.200 | 35.525 | 121.500 | 16.000 | 15.800 | 15.000 |
| 22 | 24.200 | 34.950 | 121.500 | 16.000 | 15.800 | 15.000 |
| 23 | 24.200 | 35.350 | 121.500 | 16.000 | 15.800 | 15.000 |
| 24 | 24.200 | 35.325 | 121.500 | 16.000 | 15.800 | 15.000 |
| 25 | 24.200 | 35.125 | 121.500 | 16.000 | 15.800 | 15.000 |
| 26 | No Market | 34.825 | 121.500 | 16.000 | 15.800 | 15.000 |
| 28 | 24.200 | 35.475 | 121.500 | 16.000 | 15.800 | 15.000 |
| 29 | 24.200 | 35.425 | 121.500 | 16.000 | 15.800 | 15.000 |
| 30 | 24.200 | 34.850 | 121.500 | 16.000 | 15.800 | 15.000 |
| 31 | 24.200 | 35.000 | 121.500 | 16.000 | 15.800 | 15.000 |
| **AVERAGES FOR MONTH** | | | | | | |
| July | 24.200 | 34.815 | 121.500 | 16.000 | 15.800 | 15.000 |
| **AVERAGES FOR WEEK** | | | | | | |
| July | | | | | | |
| 2 | 24.200 | 35.217 | 121.500 | 16.000 | 15.800 | 15.000 |
| 9 | 24.200 | 34.223 | 121.500 | 16.000 | 15.800 | 15.000 |
| 16 | 24.200 | 34.533 | 121.500 | 16.000 | 15.800 | 15.000 |
| 23 | 24.200 | 34.900 | 121.500 | 16.000 | 15.800 | 15.000 |
| 30 | 24.200 | 35.171 | 121.500 | 16.000 | 15.800 | 15.000 |
| **CALENDAR WEEK AVERAGES** | | | | | | |
| July | | | | | | |
| 5 | 24.200 | 34.730 | 121.500 | 16.000 | 15.800 | 15.000 |
| 12 | 24.200 | 34.502 | 121.500 | 16.000 | 15.800 | 15.000 |
| 19 | 24.200 | 34.617 | 121.500 | 16.000 | 15.800 | 15.000 |
| 26 | 24.200 | 35.183 | 121.500 | 16.000 | 15.800 | 15.000 |

## Silver, Gold and Sterling

### DAILY AND AVERAGE PRICES

| July 1952 | Sterling Exchange "Checks" | Silver (c) New York | Silver (c) London | Gold London | Gold (d) United States |
|---|---|---|---|---|---|
| 1 | 278.7500 | 82.750 | 72.500d. | 248s. | $35.00 |
| 2 | 278.7500 | 82.750 | 72.500d. | 248s. | 35.00 |
| 3 | 279.2500 | 82.750 | 72.500d. | 248s. | 35.00 |
| 4 | Holiday | Holiday | 72.500d. | 248s. | Holiday |
| 5 | (e) | (e) | (e) | (e) | 35.00 |
| 7 | 279.2500 | 82.750 | 72.500d. | 248s. | 35.00 |
| 8 | 279.2500 | 82.750 | 72.500d. | 248s. | 35.00 |
| 9 | 279.2500 | 82.750 | 72.500d. | 248s. | 35.00 |
| 10 | 278.6250 | 82.750 | 72.500d. | 248s. | 35.00 |
| 11 | 278.2500 | 82.750 | 72.500d. | 248s. | 35.00 |
| 12 | (e) | (e) | (e) | (e) | 35.00 |
| 14 | 279.2500 | 82.750 | 72.500d. | 248s. | 35.00 |
| 15 | 278.6250 | 82.750 | 72.500d. | 248s. | 35.00 |
| 16 | 278.6250 | 82.750 | 72.500d. | 248s. | 35.00 |
| 17 | 278.6250 | 82.750 | 72.500d. | 248s. | 35.00 |
| 18 | 278.6250 | 82.750 | 72.500d. | 248s. | 35.00 |
| 19 | (e) | (e) | (e) | (e) | 35.00 |
| 21 | 278.6250 | 82.750 | 72.500d. | 248s. | 35.00 |
| 22 | 278.6250 | 82.750 | 72.500d. | 248s. | 35.00 |
| 23 | 278.6250 | 82.750 | 72.500d. | 248s. | 35.00 |
| 24 | 278.8125 | 83.250 | 72.500d. | 248s. | 35.00 |
| 25 | 278.6875 | 83.250 | 73.000d. | 248s. | 35.00 |
| 26 | (e) | (e) | (e) | (e) | 35.00 |
| 28 | 278.6875 | 83.250 | 73.000d. | 248s. | 35.00 |
| 29 | 278.8125 | 83.250 | 73.000d. | 248s. | 35.00 |
| 30 | 278.9375 | 83.250 | 73.000d. | 248s. | 35.00 |
| 31 | 279.2500 | 83.250 | 73.000d. | 248s. | 35.00 |
| **AVERAGES FOR MONTH** | | | | | |
| July | 278.827 | 82.886 | 72.609 | — | 35.00 |
| **AVERAGES FOR WEEK** | | | | | |
| July | | | | | |
| 2 | 278.563 | 82.750 | — | — | — |
| 9 | 279.250 | 82.750 | — | — | — |
| 16 | 278.675 | 82.750 | — | — | — |
| 23 | 278.625 | 82.750 | — | — | — |
| 30 | 278.788 | 83.250 | — | — | — |

Calendar week averages, New York silver: July 5th, 82.750; 12th, 82.750; 19th, 82.750; 26th, 82.950.

(e) No market (Saturday).

THE above quotations for major non-ferrous metals are our appraisal of the important United States markets, based on sales reported by producers and agencies. They are reduced to the basis of cash, New York or St. Louis. All prices, except gold and silver, are in cents per pound.

(a) Net prices at refineries on Atlantic seaboard. To arrive at the delivered New England basis add 0.300c. per pound, the average differential for delivery charges.

(b) Our export quotation for copper reflects prices obtaining in the open market and is based on sales in the foreign market reduced to the f.o.b. refinery equivalent, Atlantic seaboard. On f.a.s. transactions we deduct 0.075c. for lighterage, etc., to arrive at the f.o.b. refinery quotation.

Copper, lead and zinc quotations are based on sales for both prompt and future deliveries; tin quotations are for prompt delivery only.

Quotations for copper are for the ordinary forms of wirebars and ingotbars; cathodes are sold at a discount of 0.125c. to 0.15c. per pound. Quotations for zinc are based on Prime Western brands. Zinc in New York commands a premium over the St. Louis basis equal to the freight differential. Contract prices for High Grade zinc delivered in the East and Middle West, effective Jan. 1, 1951, commanded a premium of 1.35c. per pound over the current market for Prime Western; Special High Grade 1.50c.

Quotations for lead are based on domestic common lead. Corroding lead commands a premium of 10 points.

(c) The daily New York silver quotation reported by Handy & Harman is for silver contained in ores and other unrefined silver-bearing materials, in cents and fractions of a cent per troy ounce. It is determined by Handy & Harman on the basis of actual sales of bar silver .999 fine in amounts of 50,000 ounces or more for nearby delivery at New York, as reported daily by regular suppliers, and is usually one-quarter cent below the price paid for such bar silver, this deduction being the allowance to such suppliers for carrying, delivering and marketing. In addition to foreign silver, the quotations also apply to domestic silver if such silver enters into the New York market.

The Treasury's purchase price of newly mined domestic silver is 90.5c. per troy ounce 1000 fine, effective July 1, 1946. London silver in pence per troy ounce, basis .999 fine.

(d) U. S. Treasury's gold price. Actual payment by the United States Treasury for gold is at 99.75 per cent of the price quoted by the Treasury, which is equal to $34.9125.

# Behind the By-Lines . . .

G. P. Lutjen

**It's utterly demoralizing** the way the ladies, God bless them, can deflate us mere males with a casual comment, a conversational flick of the wrist, as it were. As a for-instance, we submit the following note, which we received this month, from an Aurora, Colo. reader.

"Upon seeing the cover of your July, 1952, issue ("Commercial Taconite is on the Way"), my wife exclaimed:

" 'Why do they decorate the front of that mining magazine with pictures of little cabbages?' "

As a poker-table philosopher said when four queens beat his full house, "What are you gonna do?"

**Company presidents, vice presidents and chairmen of boards** are made, not born. What we are interested in is who makes them and why. Too often the selection of men to fill the most vital posts in the mining company is made on a haphazard inconsistent basis. *A* was made vp because he's near and dear to an important stockholder; *B* was promoted because he can say "yes" faster than anyone for several counties around; *C* they had to bring up because he knows where the body's buried. These criteria don't make for the brightest of futures and perhaps your company has already thrown them out of the window. But do you have a good system for finding out what men in your organization have executive talent? If the answer is "no" (or even if it's "yes"), you should get a lot out of the article on p. 72 by F. Newton Parks, "How To Find Men To Fill Mining's Executive Jobs."

And just because you happen to be below the top echelon and not selecting any vice presidents this year, don't pass this article up. After all, is the functioning of the draft board more important to the selector or the selectee?

**You will undoubtedly be glad to hear** that, at the last meeting of the *E&MJ* Chowder and Marching Society, we settled the columbium-niobium fracas once and for all. Maybe you didn't know about this big hassle. Neither did we—not until last month anyway. Now we know all about it and if you'll pour yourself another sarsparilla and find a comfortable seat, we'll be glad to fill you in.

Perhaps you saw the report on "one of the world's biggest deposits of uranium" in Nigeria, among the African news items in the July issue. Mentioned prominently was an apparently valuable niobium compound. Our man for Africa became curious about this "new" metal, but available handbooks and texts didn't mention it. Finally he turned to the dictionary. Under *ni-ó bi-um* was only the cryptic statement, "See Columbium."

Under *co-lum bi-um* we got the whole story. After five lines of authoritative information on the metal, Mr. Webster states, "The element was discovered in 1801 by Hatchett in columbite from America and by him named columbium; it was rediscovered in 1844 by Rose who then called it niobium."

A clear-cut case, it seems to us. This chap, Rose, and his niobium are a couple of Johnny-come-lately's, and hereafter "columbium" (Cb) should be used exclusively.

As far as we can determine from limited evidence, confusion on the subject is mainly the result of stubbornness on the part of Her Majesty's Department of Geological and Industrial Research in London, which persists in using niobium (Nb). Just in case there's more to this unyielding attitude than meets the eye, perhaps Her Majesty had better have Her Majesty's D.G.I.R. investigated. And we know just the boys who can do it; a couple of U.S. congressmen with loads of investigating experience. Will be available after November 4.

**We certainly have run** this whole hogan question into the ground, but just the other day we finally received the straight dope from H. Z. Stuart of New York, and we want to pass it along for the record.

"*Your query . . . as to why the doorway of the Navajo's hogan always faces east interested me. I have since found that knowing the answer, and being able to offer documentary support for same are two different things in this case—hence my delay in volunteering information.*

"*However, Mr. Raymond Carlson, editor of* Arizona Highways *comes to my rescue in the July, 1952 issue. . . . 'Indeed, they are worshipers of the sun and build their hogans with the opening facing the east so that when they venture forth at the beginning of each new day, the sun is the first to greet them.'*

"*To add a bit to the above, the Navajo are a proud and dignified people, made so perhaps, by the consciousness that they have survived for centuries in an environment at once harsh and majestic. To themselves, they are 'The People.' Whether the morning prayer addressed to the 'Great Giver of Life' ascribes this power to the sun alone, or to a greater Being who is represented by the sun, the requirement that this rite be the initial act of the new day makes it natural that the doorway of the hogan should face toward the east.*"

**Our Festive Beverages editor** slipped us a report on the quaint custom practiced by Jugoslavian Airlines. Right after take-off on all flights, the stewardess comes up the aisle with a tray of slivovitz. Before you spit back at us we should add that this is plum brandy, a common drink of the country. Its effectiveness, it is reported, falls somewhere on the curve between vodka and dynamite. At any rate, the airline guarantees an enjoyable flight after two jiggers. In fact a positive statement is made that "you'll even want to help the stewardess serve the passengers and help the pilot fly the plane." To one who has never flown anything larger than a kite, this sounds pretty alarming, but we don't scare easy. Bartender—a double slivovitz on the rocks, if you please.

ENGINEERING AND MINING JOURNAL
AUGUST, 1952

# The Paley Report

THE VOLUMINOUS, and quite possibly momentous, report of the President's Materials Policy Commission (the Paley report) may well have a good deal to do with the course of the mineral industries over the next 25 years. Whether or not you agree with its premises or its conclusions, you will find this document frequently referred to in the future, and a careful study of it would be well worth your while.

We were struck at once by the apparent belief of those who wrote much of the report that the government is going to have to take an increased share in handling the problems of the future. The majority of the proposals involve either new activities for government or simply revision or extension of existing authority.

Well, look around you. Who, in the mining industry today, is *not* getting some kind of aid from the government? We can think of only a very few companies that might qualify.

However, we dislike intensely the PMPC's proposal that international governmental control of metals and minerals be established, including distribution quotas and buffer stocks, in order to stabilize world markets. The commission's idea is that if private industry sets up a cartel to stabilize markets the result is curtailed production and high prices, whereas if governments do the same thing the result would be increased production at a lower price.

This government-model cartel would be an expensive business to run. We noted that the PMPC recognized "the fact that the United States would be called on to finance a considerable share of the costs."

That means you and me and all the other taxpayers who are already financing much of the world's efforts to better itself.

We're not complaining. All we ask is that the money we pay in taxes be used to finance projects that at least make practical sense. We don't think this one does. No private group has ever upset world markets as radically as our own government has in recent months. Why would it promote wise behavior and stability to give the same government even greater power to interfere in world markets?

On the other hand, we agree with the PMPC's proposals to continue present percentage depletion rates, but drop those easily-found minerals given the benefit of percentage depletion in the Revenue Act of 1951. Also, the suggestions are sound on removing limits on expensing exploration costs and on liberalizing tax treatment of domestic corporations with foreign subsidiaries.

On mining claims, the commission would eliminate extralateral rights on claims filed hereafter, would require all claims to be recorded and maps made available to prospectors, and would take other action aimed to clarify and to make more equitable the present mineral code.

The report calls for stockpile acquisitions to be made at minimum cost without favoritism to any producer or producer group. This assumes that a stockpile of metals or minerals is to be amassed, and held, for strategic purposes only.

Any aid to domestic mining, the report says, should be made through various means now used, with extra attention being given exploration incentives, particularly for small mining enterprises. We have no serious objection to the proposals in these three categories.

We think the PMPC is unrealistic in calling for abolition of tariffs on those metals or minerals for which the U.S. depends substantially on imports, except for such metals as nickel where there is no significant domestic production. We think tariff reductions can and should be made only gradually, as conditions warrant.

We applaud the PMPC's recognition that the best conservation of national mineral resources is to maintain an active progressive mineral industry. We think, too, that the commission is right in believing that the great national problem over the long pull will be to produce enough minerals, not how to handle a surplus. Still, when the present defense spending program has run its course over the next year or so, we may face an economic set-back, if not a depression.

Looking out over the dip lying ahead, however deep it may be, one can see with only the smallest amount of courage to aid his vision heights of economic well-being greater than any yet reached. We know that to gain those heights will mean industrial expansion and increasing demand for the products of mining.

That's the real value of the Paley report, the impulse it gives all of us to think broadly and courageously about the future, to recognize that we all have a job to do, today and tomorrow.

# How To Find Men To Fill Mining's Executive Jobs

**There's a manpower shortage in mining's executive ranks. Here's a suggestion on how to spot the potential top executives among the men now holding jobs of lesser responsibility.**

F. NEWTON PARKS,
Booz, Allen & Hamilton
New York, N. Y.

THE MINING INDUSTRY faces an important problem that confronts industry in general—a shortage of top management manpower.

There is no challenging the fact that industrial executives are staying in the saddle longer. The managements of a representative 65 industrial companies were, on the average in 1949, seven years older than were the managements of these same companies 20 years previously. These figures were pointed up in a recent Booz, Allen & Hamilton survey:

**Industry's Executives Are Growing Older**

| | 1929 | 1949 |
|---|---|---|
| Average age of all officers (excluding chairmen).. | 47 | 54 |
| Average age of presidents ..... | 53 | 59 |

This trend was, and still is, causing serious concern in industrial circles. However, from all indications, the mining industry is in an even less favorable position. The average age of 32 mining company presidents and 76 of their vice presidents are compared with the foregoing general industry situation in the following table:

**Mining's Executives Are Older Than Industry's Generally**

| | Mining | Non-Mining |
|---|---|---|
| Average age of Presidents ..... | 62 | 59 |
| Average age of Vice Presidents. | 60 | 55 |

In the 32 mining companies analyzed 21, or 65%, of the presidents are or will be 65 years of age within the next five years. Most modern pension plans would call for their retirement. Of the vice presidents 46, or 61%, would retire within the next five years by this measuring stick.

There are a number of generally accepted reasons for the executive shortage in the mining industry. In the first place, the depression was especially severe in mining. Potential management left the industry and, in many instances, did not return. Registration at mining schools was low. Then, too, many young men of management calibre found the early going in the mining camps unpalatable. Compensation practices in the industry must also shoulder some of the blame. Compensation in the mining field has lagged behind that in other industries. Of course, in addition to the foregoing, a major reason for the executive shortage has been the increasing demand for management manpower in the growing mining industry.

Accordingly, it is not surprising that mining companies often have had to fill their needs for executives by reaching into other companies in the industry. Nor is it surprising that, in several recent instances, mining companies have gone outside their own industry to fill top management positions.

In general, then, the mining industry is faced with a serious executive replacement problem as the present top management group passes from the scene (in many instances, perhaps later than is good for them or their companies, although, of course, attainment of age 65 does not by any means denote infirmity). Inter-company movement plugs a few holes in the dike at the expense of others and is obviously not the answer.

What then is the answer to this executive shortage?

The long-term solution is the rapid development and upgrading of middle management. Two closely related programs are called for: executive appraisal and executive development. This discussion deals with the first program—executive appraisal.

## Problems of Executive Appraisal

The mining industry appears to have lagged behind other industries in facing up to the need for better management appraisal programs. Many mining companies appraise their middle management executives (the level beneath the vice presidents) too infrequently, and oftentimes in an unorganized manner. The result is that promotions often are made on only the most obvious evidence, not necessarily the most significant. Bonuses or salary adjustments often are distributed without sufficient measurement of performance. Furthermore, middle management is not given as much constructive encouragement, criticism and direction as it needs to bring it along fast.

## Selected Appraisal Factors

The first step in an appraisal program is to select the key factors that go to make up a particular management job. These factors will be different for operating and staff jobs. They perhaps should differ from company to company, and perhaps even from mine to mine or mill to mill within a company.

In the case of mine manager or superintendent, the following specific appraisal factors might be selected:

| | |
|---|---|
| Volume | Safety |
| Cost | Labor Relations |
| Quality | Maintenance |
| Administration | |

It might be argued that if costs and volume are under control, the other factors in this list also will be in line, or that mine management is doing a good job if it is getting good costs per ton. How-

ever, the opposite may be the case.

Over the short term, maintenance may be side-stepped to benefit the cost picture and future mine management left to pay for today's neglect. Similarly, unsound labor compromises may be made today to secure volume operation at the expense of long-term labor chaos.

The off-hand appraisal methods of many companies indicate that the problems involved are frequently underestimated. Thus, in appraising a mine manager, the cost and production record does not tell the whole story. The mine manager cannot be judged strictly on tons per man shift or dollars of cost per ton. Too many "Acts of God" influence these apparently satisfactory yardsticks. Top management needs better appraisal methods to make fair judgments.

Moreover, the problems of top management are not limited to volume and cost. If these factors are held too high to the exclusion of other appraisal factors, middle management, from whose ranks will come tomorrow's top management, will have a number of flat sides.

Accordingly, there is need for a comprehensive, organized approach to the appraisal problem. Top management must carve out a program to get its answers. A program should have these elements:

- Selected appraisal factors
- Performance objectives
- Performance appraisals against objectives
- Performance reviews with executives
- Payoff in terms of promotions, salary adjustments or bonuses

The objective, then, in the selection of appraisal factors is to arrive at a balanced picture. The factors should be limited to a workable number and should be keyed to the entire job to be done.

## Performance Objectives

The appraisal factors, once established, must have life breathed into them.

This calls for definite performance objectives to be set up for each factor. Objectives fall into two broad categories: those that can be measured in specific units and those calling for judgment alone.

Among objectives that can be measured in units are cost factors such as direct labor costs per ton of production and material costs per ton of production. In the safety area, figures on severity and frequency may be used. In the labor area, suitable yardsticks may be absenteeism or grievances.

These objectives, of course, should also be based on variable standards for given mine conditions.

Where a standard cost system is in operation, the job of setting objectives in the cost area is obviously made easier. Oftentimes, however, standards of any kind are lacking. In those cases, it is advisable to use historical data first and gradually build up standards through time studies and other analyses over a period of years.

Although certain management objectives are not measurable in units, they nevertheless may be equally as important as measurable areas. Such objectives are found frequently in the administrative area. Typical of the factors that should be considered are the following: Is mine management effectively developing its supervisors? Is it submitting meaningful reports to top management? Is its internal report structure sound?

Whether expressed in units or in general terms, all objectives should be set periodically and adjusted at given intervals. In all cases, the manager should be in agreement on the fairness of objectives set for him.

## Performance Appraisal

The objectives are, of course, the yardsticks that a manager's performance should be measured against. Herein, judgment plays a big role. For example, a manager should not necessarily be rated down if his operations have been victimized by wildcat strikes. These strikes may be beyond the manager's control. The factor to judge him on is whether the strike situation was handled with sound judgment and a firm hand.

The point is this, however: If objectives are intelligently set, and good management reports and records are kept, it is apparent that tools exist to assist top management in its judgment of middle management.

Good reports, incidentally, are an important by-product of an appraisal program. Management reports and records must be current, in order, and must be pinpointed to provide adequate appraisal answers.

Top management should not limit its appraisal of managers to the reported results of operations. Examinations of properties and discussions with various members of the management team also contribute to a comprehensive performance appraisal. A few talks over a lunch bucket with some of the muckers might measure the pulse of a labor situation to a sensitive top management.

One thing is certain. If top management determines to improve and systemize its appraisal program, it is going to find in the process that it will be better informed as to what is going on in its mines, mills and smelters.

## Performance Reviews

The mine manager himself must get in on this act; that is, top management must review its appraisal with the manager and make the program a two-way street if it is to be constructive. His entire performance record should be examined and discussed with the mine manager. In this give and take, appraisals may be proved inaccurate where noncontrollable circumstances, unbeknown to top management, have affected performance.

This is the stage of the program wherein all the cards are turned upward on the table.

## The Payoff

Finally comes the payoff. The payoff may be reflected in a number of ways for the mine manager, chief engineer, chief geologist, and whoever else is appraised in the program. Incentive bonuses, profit sharing bonuses, stock options, salary adjustments or promotions are all tangible rewards for work well done. Perhaps equally important is the intangible satisfaction of knowing what is expected and a fair measurement of accomplishment.

For top management, the payoff is the orderly development of its best orebody—its management personnel. Top management will find that it is getting closer to its men on the level below. It will be in a position more often to pick its replacements with the assurance that the right man is probably being flagged up. In today's short supply of top management, these replacements must be picked oftentimes before they are ready. More than ever, then, the choice has to be the right one.

DON LINDGREN, general manager.

JIM HUSTAD, president, and Walt Steinke, general superintendent

BOB CRASSWELLER and Walt Steinke examine high-grade lump ore.

## THE OPERATORS FROM MINNESOTA

**THE WHOLE IDEA of organizing and developing the West Indies Mining Co. was conceived by Jim Hustad and Bob Crassweller several years ago in Duluth. With the aid of small investors in Minnesota, they obtained the present Puerto Rican concessions and now share controlling interest in the company. Walt Steinke, general superintendent, brings with him a wealth of mechanical and operating know-how from the Minnesota Iron Country, and Don Lindgren has recently joined the company as general manager.**

# Minnesota Mining Men Open Up

A. W. KNOERR
Associate Editor

WE JUST COULDN'T HELP asking two Duluth boys, Jim Hustad and Bob Crassweller, how they happened to be running an iron mine in Puerto Rico, and in their answer lies the story of a rugged little free enterprise that was all but washed out from the start by a deluge of tropical rains, a sinking ore ship, poor loading facilities, ships piling up in the harbor with demurrage at $1,000 per day, and unbelievably-low working capital.

First, it is important to know that Jim Hustad formerly worked for Oliver Iron Mining Co. from 1937 to 1951 after getting his degree in geology from the University of Minnesota. His field examinations took him to Africa, South America, and the West Indies. Bob Crassweller, a Harvard Law School graduate, was a member of a successful Duluth law firm, and well versed in corporate, mining, and tax matters. Both gave up the security of good jobs to start up the West Indies Mining Corp. in Puerto Rico. Here's how it happened:

It all began back in 1950 when Jim and Bob were having lunch at the Duluth Chamber of Commerce. They were remarking about the prosperity of the small operators on the Iron Range, when Bob said, "If you know of any small iron ore property that the Steel Corp. isn't interested in, I'd like to see what I can do about getting it financed." Jim said he knew of a property in Puerto Rico which the Steel Corp. turned down because it was too small. Since Puerto Rico exempts new business from taxes, Bob was more than mildly interested. So with the help of a small group of Northern Minnesota investors, two

GASH IN HILL beyond cane field marks Keystone Mine.

OVERBURDEN IS STRIPPED with a ¾-yd. power shovel.

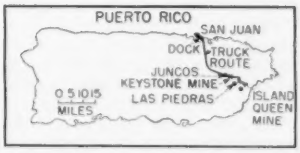
## THE KEYSTONE IRON MINE

**THE KEYSTONE MINE, situated about 32 mi. from San Juan, Puerto Rico, was opened up by West Indies Mining Co. early in 1951, and is now producing about 30,000 tons of iron ore a month for shipment to the U.S. Stripping is done with a ¾-yd. Koehring shovel, and mining with a ¾-yd. P & H shovel. The ore running 60% plus Fe is trucked to a dock and stockpile area at San Juan harbor. Heavy rains last year washed the hillside mine road hundreds of feet into the sugar cane field below.**

CLOSE-UP reveals truck-and-shovel open-pit operation.

# Rich Puerto Rico Iron Mine

of whom were small operators on the Range, Jim and Bob pooled their talents and resources and organized the West Indies Mining Corp. in Puerto Rico in February 1951. One of their most enthusiastic supporters and backers is E. A. Young, president of several small mining companies in Hibbing, Minn., who advanced the initial funds for travel and organization. Controlling interest in the company is shared equally by Jim and Bob who are also actively running it. In fact, it is not at all unusual to find them pitching in in dungarees in any part of the operation needing an extra hand or some extra supervision. Both of them know what it is to work 24-hour days with only a catnap here and there to get the iron ore off the hill and onto a ship when the going's rough.




LOCATION of two iron ore mines.

In fast order, a mining concession for the Keystone Mine some 32 mi. southeasterly from San Juan was acquired by the new company. Here surface outcrops and existing tunnels and adits indicated at least 175,000 tons of good shipping iron ore. Two Insular agencies, the Economic Development Administration and the Puerto Rico Industrial Development Co., were extremely helpful in getting the new enterprise started, and both Jim and Bob are outspoken in their praise for the manner in which the Insular Government encourages new enterprises through these agencies.

With unbelievably low working

CRUSHING AND SCREENING PLANT at the Keystone mine has a capacity of 500 to 600 tons per shift.

## Facts in Brief about the

### Geology and Description of Orebodies

***Keystone Mine.*** **Located in the Juncos-Torres District about 32 mi. southeasterly by road from San Juan. Deposit averages 50 ft. in thickness. Consists of volcanic extrusives, mainly bedded tuffs and thin basic flows, replaced by magnetite and some hematite. Highly altered dikes cut deposit transversely, and are partially replaced by ore minerals. Origin: Replacement along a shear zone. General strike about N. 60 deg. W., and dip, 50 deg. N.E. Main ore lenses contain interlayered lean material estimated to average about 35 ft. thick for a 500-ft. length. If the deposit extends to a depth of 100 ft. indicated ore will total about 175,000 gross tons.**

***Island Queen Mine.*** **Situated about 6 mi. southeast of the Keystone property. A roughly defined mineralized zone with outcrops and adit exposures of ore in place on one side of a hilltop and another outcrop on opposite side several hundred**

PUERTO RICAN WELDER applying hard-metal strips on a shovel bucket. He was so eager to get his job done, we could hardly get him to pose.

### What It Takes To Run

**Keystone Property**

Mine.
- Two ¾-yd. P&H 255A diesel power shovels
- One ½-yd. P&H 655B diesel power shovel
- Ingersoll-Rand wagon drill
- *Ingersoll-Rand Gyraflow compressor
- Gardner-Denver 365 compressor
- Two Oliver Cletrac tractor-bulldozers
- International TD18 tractor
- Ford F-1 Pickup truck

Crushing and Screening Plant.
(Capacity 500 to 600 tons per shift)
- 50-ton steel loading hopper
- Grizzley yielding plus and minus 6-in product
- 50-hp. Universal jaw crusher, 18x24 in.
- 10-hp. Universal pan feeder, 38-in. x 14 ft.
- 15-hp. double-deck vibrating screen
- 30-ft. portable conveyor

capital, measured in thousands of dollars (and plenty of guts), rather than tens of thousands, immediate shipment, production, and sale of ore was a must. A buyer for the high-grade ore was soon found in Barium Steel Corp. which uses the ore at the Chester Blast Furnace Division at Chester, Pa. Southern Trading Co., a ship chartering firm, was engaged to transport the ore from the San Juan docks to Chester. Because of the 26-ft. draft at Chester which couldn't handle usual 10,000-ton craft, converted 4,000-ton LST's were used for initial shipping. The 32-mi. ore haul from mine to dock at San Juan was handled by contract truckers. (Peak construction activity on the Island makes earth moving and hauling equipment readily available.)

At the mine things moved fast. First development work, started May 2, 1951, consisted of construction of a gravel road over what was originally a 40% grade to the top of the hill exposing the Keystone orebody, plus a small amount of stripping. A ¾-yd. power shovel loaded the first truckload of ore on June 12, and on July 5 the first 4,000-ton shipload of ore was on its way to the States. Mine output up to 1,000 tons per day was put through a crushing and screening plant yielding a premium lump ore product of plus 1 in., and a standard ore of less than 1-in.

Facilities of a local drydock firm were engaged to load ships at the start, but this proved to be too expensive. At best the three steam cranes on the dock could only load a 5,000-ton ship in 41 hours which entailed excessive demurrage charges. So Jim and Bob planned to install their own loading facilities at a stockpile and dock site which was rented from the Island Transport Authority adjacent to the San Juan airport. Accordingly a portable hopper and conveyor belt for loading was ordered for September delivery.

Then a combination of unforeseen events really rocked the little West Indies enterprise on its heels during the autumn of 1951. Here's how Bob and Jim recalled the

## West Indies Mining Corp.

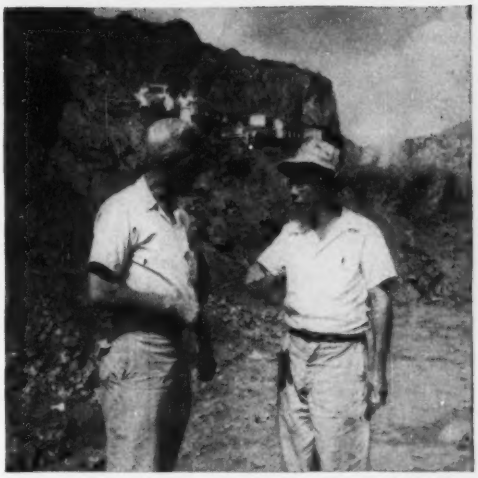
**feet away. These two exposures appear to establish a rough strike of the ore zone approximately parallel to that of the Keystone. Boulders overlaying ore zone contain 60% Fe. Similar boulders of magnetite are found in bottom of a gulley hundreds of feet below the outcrop.**

**Typical Analysis of Shipping Ore**

| | |
|---|---|
| Fe | 60% guaranteed |
| $SiO_2$ | 7-8% |
| P | 0.030% |
| S | 0.030% |
| Mn | Slight amount |
| Other impurities | Negligible |

**Wage Scales**

| | |
|---|---|
| Shovel runners | $1.60 per hour |
| Bulldozer operator | 1.25 |
| Common labor | .53 to 60¢ |
| Carpenters | .75 |
| Drillers | .90 |
| Welders | .90 |



**WALT STEINKE, superintendent, and Jorge Rodriguez, Keystone mine foreman discuss a few production problems.**

## The West Indies Mines

### The Island Queen Property

¾-yd. Koehring 344 diesel power shovel
D7 Caterpillar tractor
Pioneer double-deck vibrating screen, 4x10-ft.
*Universal jaw crusher 24x36-in.
125-hp. Murphy diesel-electric motor

### The Dock at San Juan

¾-yd. P&H 255A diesel power shovel
Telsmith heavy-duty plate feeder
60-ft. portable conveyor
RD-4 Caterpillar tractor
Autocar truck and Rogers semi trailer
Thurman portable motor truck scale, 30-ton
P&H portable 250-amp. welder
Model T310 Quincy compressor

*Equipment on order

**ACCESS ROADS, LIKE THIS leading to the new Island Queen mine, had to be carved out with bulldozers by development crews of the company.**

trying events of last autumn:

"The blackest period of our operations came in September 1951. Unusually heavy rains fell near Juncos during the month and near the end of September, three ships bunched up at the dock, ready to load within a few days of one another. The stockpile wasn't big enough to take care of all of them so great efforts had to be made to provide cargoes. At the same time, the heaviest rains came, lasting for eight days with never an interruption for more than an hour at a time.

"After several days of this, the steep road up to the mine began to weaken, and became almost impassable except by a truck which had one bulldozer chained to the front and another to the rear. Mud banks 10 ft. high bulldozed from the road obstructed traffic. At times the road was covered with a solid sheet of water 12 in. deep. Right in the middle of this dripping 24-hour-a-day effort to mine and truck ore, part of the road, undermined by rains, slid bodily down the hill landing in the middle of a cane field several hundred feet below. Then a new road had to be carved out of the hillside.

"All this time, ships were loading, or waiting at a typical demurrage rate of $1,000 per day. Finally the ships were loaded, but this process in itself was sufficiently trying because the loading equipment scheduled for September delivery had not arrived, and there was no means of getting the ore into the ship except by renting Navy equipment. To do this, the Transportation Authority was persuaded to request a lease of equipment from the Navy, since the Navy can't lease equipment directly to civilians. The Transportation Authority then leased the equipment to us for the emergency, but loading was touch and go since the Navy could have recalled the equipment at any time.

"But when the ships left, our troubles were really only beginning. A few days later, early in October, one of them sank off

## MORE ABOUT THE MAN ON THE COVER

**JULIO DAVILA, hard-working dock foreman at San Juan harbor, is in charge of stockpiling the ore and loading ships. He shows unusual pride in his work and particularly the ore which he ships. So to capture a bit of that pride photographically, we asked him to say "This is some of the best iron ore in the Caribbean"—just as we snapped the shutter. Julio and his crew have to maintain dock equipment including power shovel, trucks, bulldozers, and portable hopper and conveyor in good operating condition to avoid delays and heavy demurrage charges. Truck at upper left is unloading ore from the mine, and bulldozer (left) trims the stockpile.**

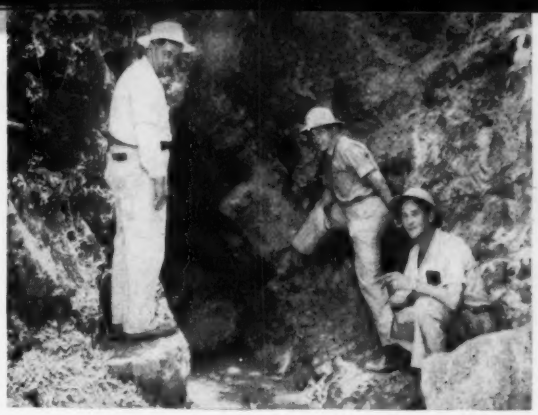
South Carolina, breaking in two and sinking in five minutes with considerable loss of life. This all happened shortly after the company had embarked on a program to purchase equipment, and down payments amounting to many thousands of dollars were due. The money for the lost cargo had been carefully budgeted to apply on these payments. Payment for this cargo had been received when the ship sailed, by letter of credit, but this was revoked when the ship sank and the bank took the money out of the company's account, thus putting the equipment purchase commitments in peril. A loan had been solicited from the San Juan branch of a New York bank to complete the payments for the equipment, but this was too large for the branch to pass on, and a decision had not come from the New York office."

All of this called for some real fast action, so when revocation of the cargo payment became known, Bob flew to New York, on five hours' notice, to attempt to adjust the insurance claim on the lost cargo, to arrange for the bank loan, and to arrange if possible for the reinstatement of the revoked payment under the letter of credit. To add to all this chaos, Jim called Bob the following morning at 10 o'clock saying that the equipment seller was going to leave Puerto Rico at five that afternoon and had to have his down payment before then, or the equipment purchase program would be lost. To make the down payment, it was necessary to have assurance of the bank loan for the balance. The down payment itself, being lost through revocation of the cargo payment, had to be scraped together from sums allotted to other bills. So Bob rushed to the New York bank headquarters and persuaded them to make the loan in 30 minutes, telephoned the San Juan branch to credit the company's account, all of which permitted the equipment payment **a few minutes before the afternoon deadline.**

By the first quarter of 1952, conditions gradually stabilized. Since LST's were ruled out as iron ore carriers by the U. S. Coast Guard, Southern Trading Co. arranged to provide 5,000-ton colliers to handle the ore. This, however, took more than a month to arrange, and the result was a seemingly endless period in the early winter when expenses mounted, but no money came in. The newly installed loading hopper and conveyor at the dock proved capable of loading one of these new ships in about 24 hours. Even here, the first loading attempt took a "hellish nine days and seven hours" because of defective equipment, and cost the company some $9,000 which it couldn't spare.

Mining is currently going on at the rate of 25,000 to 30,000 tons a month, although initial production schedules of a year ago called for only 10,000 tons monthly. The payroll totals 90 to 100, including employees at the dock, both mines and office. Under the equipment purchase program mentioned, the mine now has, or is acquiring the units mentioned in table, p. 76.

Equipment maintenance is one of the biggest problems, principally because many of the Island workers are not well versed in the maintenance of mining equipment.



# THE NEW ISLAND QUEEN IRON MINE

**WEST INDIES MINING CO. is opening up a new iron mine in Puerto Rico, the Island Queen (see map). Ramon Martinez, mine foreman (above), shows *E&MJ* visitor an exploratory tunnel driven into the ore in the early 1900's. Jim Hustad (upper right) points out huge hematite boulders in the valley below the Island Queen outcrop which he first found while tramping through the area in search for ore in 1949. Augustin Perez is operating the Caterpillar bulldozer at right. With him is Roman Sifuenta, farmer and landowner in the area. Iron ore production and crushing and screening plant operations at the Island Queen are scheduled to start this month.**

Many came from the sugar cane fields and had to be trained. Such a simple thing as getting workmen to replace caps on oil and gas tanks after they are through using them is just one of the chores of supervision. In this respect, West Indies Mining is very fortunate in having Walt Steinke as general superintendent. He hails from Chisholm on the Mesabi Iron Range and is tops on maintenance. He can operate any kind of mining machinery that runs, and knows what it can do, cannot do, and can tell what's wrong with it by listening to it. Under his guidance, many a Puerto Rican fieldhand is becoming a mechanic and miner.

Don Lindgren, also from the Iron Country, and a University of Wisconsin graduate, joined the company in April, 1952, and is pitching in, coordinating the mining, haulage, and loading phases of the production cycle, as general manager of the company.

Another right-hand supervisor of the organization is Julio Davila, dock foreman, whose home is in Puerto Rico. His big job is to see that ships get loaded, which means of course that trucks, shovels, portable hopper and loader are kept in good working condition, and that stockpiles are built up properly at the dock. When ships start coming in, he works round the clock, if necessary, catching a few winks in a hammock. During one tough loading session, he even refused to go to his uncle's funeral in order to get the "material," as he calls it, in the hold on time. In a similar way two other Puerto Rican citizens, Jorge Rodriguez, lead foreman of the Keystone mine, and Ramon Martinez, foreman of the newly developed Island Queen mine, are providing capable supervision to the growing enterprise.

## The New Island Queen Mine

Like any other well-run mine, West Indies Mining Corp. has to provide reserves for continued operation. So in addition to those of the Keystone Mine, the company has acquired the Island Queen concession some 8 mi. southeasterly from the Keystone.

The presence of iron ore at the Island Queen concession was known as far back as 1905 when an adit was driven into a promising magnetite-hematite exposure. Jim Hustad first became acquainted with the deposit in 1945 when he worked his way through the steaming hills of this area on foot for Oliver looking for ore. Huge magnetite-hematite boulders running 60% plus in iron are strewn around on top of the deposit which outcrops on a hilltop, and in the valley hundreds of feet below. Solid faces of hematite outcrop in various places, and a conservative estimate would place the ore reserves at about 50,000 tons on the basis of preliminary exploration alone.

As of July 1, West Indies Mining Corp. had shipped a total of 131,000 tons of iron ore, and future plans call for approximately the current rate of production of 25,000 to 30,000 tons monthly.

So to Jim and Bob, and their associates from the Iron Country, E&MJ says a hearty "Well done and good luck in the future operation of your plucky little free enterprise!"

# Can U.S. Management Solve Investment Problems Abroad?

**From his long experience in mining outside the United States, Mr. Sawyer draws this analysis of the problem and suggests possible solutions.**

THORP D. SAWYER
Grass Valley, California

YEARS AGO THE BELIEF WAS widely held, even among some mining men, that American mining companies operating in Latin America were exploiting their employees shamelessly.

Now, however, it is apparent, though less widely recognized, that the shoe is on the other foot. American companies in certain countries are being victimized, quite shamelessly, even to the point of extinction. Management's problems mount day by day.

Most of us realize that the outcome of the gathering world crisis will be shaped largely by what the United States does or does not do. It will take statemanship of the highest order on the part of our administrative and diplomatic officials to prevent the world from being precipitated into a ghastly, and perhaps final, war. The conduct abroad of our mining industry representatives may well have great bearing on this problem. Let us see what kind of attitude mining men face, in Latin America, at least.

A few years ago, I showed some movies to a group of mining men in California. One scene showed a group of near-naked colored boys working a Ward prospecting drill in a South American jungle. The dynamic action shown led one of the spectators to shout, "How much does your company pay those men?"

## Low Pay Deplored

As the question seemed of general interest, I replied that the drillers earned, on the average, the equivalent of a dollar a day, plus their board and keep. A murmur of surprise and disapproval went through the audience, sufficient to indicate that many felt that this was another example of American exploitation of Latin American labor and that it merited censure.

This feeling grew, no doubt, in reaction to the behavior of many American companies in Latin America shortly after the turn of the century. Some companies paid their local labor near-starvation wages and provided only the most primitive living accommodations. Further, they had little or no compunction about corrupting public officials. They occasionally interfered in politics and at times contributed substantially to the instability of governments.

## Conscience Develops

Just prior to World War I, U.S. industry in Latin America showed signs of developing a moral consciousness. Wages advanced appreciably in some localities, and in many isolated mining regions modern industrial towns were built. Housing and recreational facilities here were vastly superior to anything their beneficiaries had ever enjoyed before.

Although this development embarrassed some European-owned companies, it was hailed with enthusiasm by local officials. There were even sporadic evidences of gratitude from labor. This awakening of the employer's conscience also extended to the bribing of officials, and with many companies the practice was gradually abandoned.

Then during the middle twenties, Latin American companies began experimenting with social legislation. It is a trend we see in ever-growing strength today. Ostensibly, the motive was to improve the living standards of the workers, but political considerations undoubtedly played a large part. There is also the tendency to regard the large foreign company as a major source of the government's income, and the feeling that irreplaceable natural resources are being depleted by foreigners without adequate compensation to the country involved. Politicians talked less about gratitude to U.S. capital and more about its obligations to their country and its labor.

This development began a never-ending stream of laws and decrees that imposed increasingly onerous burdens on private enterprise and especially on foreign companies. Labor was encouraged to organize and to step up its demands.

All this can be understood and sympathized with; yet the effect has been to discourage investment of new private capital, especially in those countries that have shown no restraint in hampering the employer with inimical legislation.

A new element came in with the end of World War II. Many labor unions came under Communist control, and it seems apparent to all but the rank and file of the unions themselves that Communist policies are aimed at creating irreconcilable differences between employer and employee.

Unhappily, those companies that had done the most for their employees now suffered the most. The elaborate camps, clubs, and schools provided made it easier for the radical leaders to organize, and also enabled them to trump up an endless series of grievances over the services provided the employee.

## Communist-Led Strike

In a two-month strike in an isolated mining camp with which I was connected, the Communist-led union illegally seized the company's plants and transport, cut off power and water to the staff camps, and systematically prevented the rank and file from learning the basic issues of the strike, as well as management's point of view. A campaign of misrepresentation and personal vilification of management went on for weeks. Government labor inspectors, supposed to act as impartial umpires, largely aggravated the differences.

Finally the strike issues were submitted to arbitration; first voluntary, with the union rejecting the award, and then compulsory, with the final award being not too far above what the company had originally been disposed to offer. Had the company's point of view

been properly presented to the union membership, it is quite possible that a half-million dollar strike, with its aftermath of bitterness, might have been averted.

## New Trend Noted

These influences, if the portents are correct, are bringing about a shift in policy on the part of some U.S. companies operating in Latin America. They are recruiting their semi-skilled and unskilled labor force more and more from among local inhabitants who can provide their own housing near the mine. If they cannot, these men are assigned to bunk houses or are given a small tract of land where they can build a house out of local materials.

Such houses are built cheaply, and because they are the workman's own property, they receive much better care than a more substantial house rented at a nominal sum from the company. Also the men can share these houses with anyone, whereas management, for morality considerations, must frequently impose restrictions on occupancy of company houses.

This trend, if it is one, may seem a step backward in social progress. It is worth-while, however, if it serves to spotlight two basic needs in management-labor relations. One is the need for keeping the entire union membership informed on controversial issues. The second is the need for an interested and informed public opinion that will impose its will on weakened politicians who fear retaliation from organized labor and thus can never act impartially in labor disputes. In fact, there is no need to look beyond the present Administration in the U.S. to find examples of these needs.

Before condemning management in Latin America for exploitation of labor, consider what wage costs actually are today. In a recent wage settlement, the government of a Latin American country decided the workers at an American-owned mining company should receive a 35-peso per day increase. With this particular peso valued on the open market at about 135 to the dollar, the increase means about 25¢ to the workers. To the company, which is forced to buy its pesos to pay wages from the government at a rate of about 20 to the dollar, this wage increase means another $1.75 per man-shift.

Even without this ruinous artificial exchange rate, it is impossible to pay high wage scales in countries in a primitive state of industrial development. It takes time to educate primitive populations to use higher earnings constructively. U.S. war agencies found that out in Latin America, when they raised wages well beyond prevailing rates, only to discover that they had disrupted local industry and demoralized labor.

Nor is it any solution to grant benefits such as one employer I know who has been for years compelled to serve virtually free meals in his labor mess, with a menu comparable to that of the country's top notch hotels. Or the employer who agreed 12 years ago to hold prices in the company store at levels then existing. As inflation grows, so does the store loss, until it has become a substantial item of cost. Also people have come from all over to live cheaply, despite the company's attempts at rationing, at the expense of the mining company. Thus a sincere attempt to protect workers against price inflation has boomeranged into encouragement of waste and corruption in the district and a severe item of cost to the company.

We hear so much these days about the need for American capital investment in "under-developed areas." If it is done successfully, the situation as outlined in foregoing paragraphs must be overcome.

One way to start would be for American nationals abroad to avoid a tendency to "talk down" to nationals of the country they are in. Not only does it make those of us who do it look absurd, but it promotes a lively hostility in the recipients. Another irritant that complicates our relations with free world countries, notably Spanish speaking, is our critical attitude toward their governments.

## Interference Unwelcome

Few countries have matured politically to the point where they truly represent their people. Although we in the U.S. have thus far been able to make representative government work tolerably well, few other countries have. The result is that their governments are exposed to frequent changes, often violently. None of their political leaders recognize these dangers to the democratic process, and I believe that on the whole the big majority are now acting in the interests of law and order. For us to probe too deeply into their governmental fabric, except wnere necessary to protect investments, only incites antagonism.

There are one or two American-owned companies in Latin America that are steadily working toward closer cooperation with the people of the country in which they operate. For example, it has been made not only possible but easy for a national of the country to buy stock in the company. All company forms are now printed in Spanish; the books are kept in local monetary units. In other small, but effective ways, these companies are creating a favorable atmosphere for themselves. How long it can be maintained is a question, but the results to date are most encouraging.

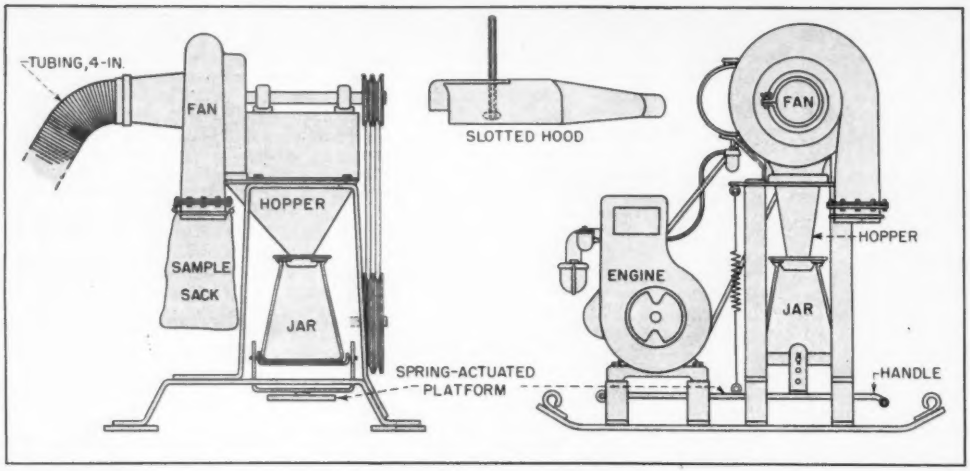
## Remote Control Ending

In many companies, policies have been framed by remote control from head offices in the U. S. by directors having little understanding of the people involved. It appears that a trend is developing to give local management more latitude in deciding policy. If men of high calibre wield these new responsibilities, the results will be more satisfactory.

Second only to negotiation with government officials, the problems of dealing with local labor have become most pressing. In fact, unless employers can regain a larger measure of control over their operations, the future may be viewed with considerable apprehension. In recent years we have been riding the crest of a wave in which both labor and capital have prospered. When the wave begins to dip toward the inevitable trough, the complications will appear.

The resulting struggle might very well drive industry into the hands of government. The economic wreckage created by socialistic experiments in various countries, Bolivia for example, makes clear what the result would be. Personal freedom and economic abundance alike would perish.

Our totalitarian friends are abroad in the world, in Latin America as elsewhere, bent on wrecking the institutions of private enterprise in order to further their own political objectives of world domination. They are the exploiters of human ignorance and avarice. Victory over them will not come easily, but if greater investment of our private capital abroad, despite the difficulties and harassments which it will encounter, will contribute to this eventual victory, it will be a bargain no matter what the cost.




**HIGH RECOVERY OF CUTTINGS, including dust, is made with the equipment shown here and in adjacent photograph. Slotted hood, shown above, conveys cuttings from drill hole to sample jar via 4-in. tubing.**

# Better Recovery Widens Use of

WILLIAM P. HULEATT
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IN TAKING SAMPLES for evaluating mineral deposits, wagon drilling may now be substituted for core drilling, the U. S. Geological Survey has found, provided the ground is dry and the drilling depth not more than 125 ft. The wagon drilling is much faster than core drilling and can be done at approximately one-third the cost.

For several years the Geological Survey has used core drilling to sample ore deposits. During 1951 experiments with less expensive methods showed that, for analytical purposes, wagon-drill cuttings could be used as effectively as cores if a practical method were devised for recovering the cuttings in suitable form. Such a method has been developed recently.

## How Sampling Is Done

A pneumatically-driven percussion-type wagon drill mounted on a mobile carrier, such as a truck or caterpillar treads, and equipped with sectional drill rods, is used in the sampling. For accurate work, the drill is operated without water and the dry cuttings are blown from the mouth of the hole by compressed air as drilling progresses. The recovery of representative samples under these conditions requires the use of special equipment. In sampling all types of deposits it is evident that if accurate results are to be obtained, the dust must not be allowed to escape. In some types, the ore minerals are soft and friable, and the chopping action of the drill bit reduces them to dust, while the harder gangue emerges from the hole as fragments up to ¼ in. in diameter. In other types of deposits, the ore minerals may be harder than the gangue.

Wagon-drill samples are more easily contaminated than cores: consequently, special care must be taken in collecting them. In drilling for evaluation, individual samples generally are taken from each unit increment of depth. As the cuttings rise to surface, they become contaminated by particles dislodged from the upper walls of the hole. This source of contamination can, of course, be eliminated by casing the hole, but this is costly in wagon drilling and creates complications. Casing is rarely considered, therefore, because the contamination from the source mentioned is not serious usually. However, the contamination of one sample by another in any equipment used to collect samples at the surface must be prevented. Such equipment should be designed so that all parts are either self-cleaning or readily accessible for manual cleaning after each sample is taken. Simplicity of design, mobility, and operating economy are also desirable.

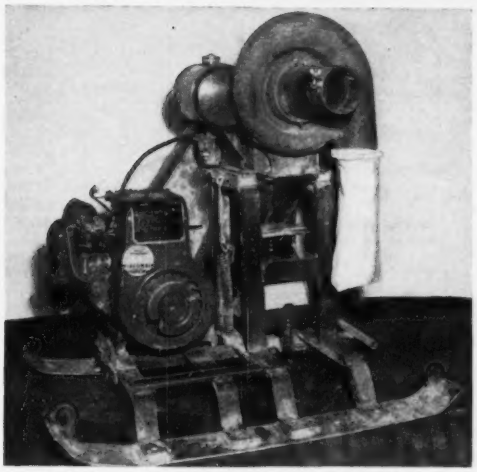
With these considerations in mind, the machine shown in the photograph was designed and built by the Survey. It gave highly satisfactory results in sampling 7,000 ft. of 2-in. holes in sandstone and shale under normal operating conditions.

## Construction Details

The sampler consists of a combined suction fan and dust precipitator driven by a gasoline engine and fixtures for collecting coarse and fine drill cuttings in suitable containers. Auxiliary equipment includes a set of pneumatic-tired wheels and a tow bar, which can be quickly attached for greater mobility, and 20 ft. of ⅜-in. air hose and nozzle. The hose is connected to the wagon-drill compressor for use in cleaning the apparatus. The assembly is shown in the drawing above.

The suction fan is a standard Type D, Size 5 Roto-clone made by American Air Filter Co., Louis-

* Publication authorized by the Director, U. S. Geological Survey.



EQUIPMENT FOR RECOVERING CUTTINGS is mounted on skids, as seen here. Note drawing.

**Comparative Costs Based on 100 ft. of Hole**

| Item | Core drilling | Wagon drilling |
|---|---|---|
| Drilling | $250.00 | $75.00 |
| Sampler's pay @ $1.25 per hour | 33.33 | 7.69 |
| Core boxes @ $2.75 each | 5.50 | |
| Sample sacks @ $13.50 per 100 | | 4.59 |
| Sampling machine, maintenance | | 1.93 |
| Sampling machine, gas and oil | | 0.70 |
| Shipment of samples* | | |
| Total per 100 ft. | $288.83 | $89.91 |

*Weight of 100 ft. of boxed core is 148 lb. as compared with 34 sacks of wagon-drill cuttings, which weigh 306 lb.

# Wagon Drill Sampling*

ville, Ky. It consists of a rotating spiral-bladed fan encased in a snail-shell housing provided with a tangential outlet through which the solids are expelled by centrifugal force. The fan is driven at 4,000 rpm by a 4-hp. air-cooled gasoline engine using a double V-belt drive, and drawing approximately 500 cfm of air. A 1-gal. glass jar serves as a receptacle for the drill cuttings. It is held in airtight contact with the hopper by a spring-actuated platform and can be released by pressure on the platform handle.

Dust and cuttings are collected by a slotted hood, shown also in the drawing. In operation, this is connected to the fan by 10 ft. of 4-in. flexible metal tubing and placed over the drill hole. The glass jar is set under the hopper, a porous cotton sample sack is attached to the fan discharge by a special clamp, and the fan is started before the drilling begins. As drilling starts, the cuttings are drawn into the fan by suction and discharged through the hopper into the jar. Being made of glass, this permits visible inspection of the material as it comes from the hole. A small amount of dust passes through the fan and is caught in the sack. When the desired length of hole has been drilled, the material in the jar is emptied into the sack and the sack labeled and sent to the laboratory.

## Trial Performance

As a test, the machine was used to sample the 7,000 ft. of 2-in. holes, already mentioned, that was drilled in sandstone and shale. Individual samples representing 3 ft. of hole weighed approximately 9 lb. Of this, 3 oz. was dust.

## Recovery of Cuttings 96%

Owing to irregularities in the walls of the holes and the unknown density of the rock in place, it was impossible to determine the exact percentage of cuttings recovered without resorting to elaborate procedures. However, observation during drilling, and weight comparisons with cores obtained from the same types of rock indicate that the recovery was 96% or more. Losses inherent in the two drilling methods, however, do not have the same significance. In wagon drilling the loss is evenly distributed throughout the length of hole, and although 100% of the cuttings is not recovered, each small increment of hole is represented in the sample. On the other hand, a 90% recovery in core drilling means that no core at all was obtained from 10% of the drilled footage, and the depths at which the losses occur are often hard to determine. Such breaks in the core record may be partly filled in by the substitution of drill sludges, but these are seldom regarded as satisfactory.

## Maintenance and Operating Costs Are Low

Cost of maintaining the sampling machine is low. The only moving parts subject to wear, besides the motor, are the fan rotor, shaft bearings, and drive belts. After sampling 7,000 ft. of hole, it was necessary to replace the fan rotor, shaft bearings, and one section of the fan housing, and to make minor repairs on the gasoline engine. Total cost of reconditioning was less than $135, or $0.0193 per ft.

The current average contract cost for core drilling AX holes (1⅛-in. dia. core) to depths of 125 ft. or less, in shale and sandstone is approximately $2.50 per ft., as compared with $0.75 per ft. for wagon drilling in the same type of ground (130 ft. as against 30 ft. per eight hours). The faster rate of wagon drilling means an additional saving in sampler's wages. Because of fluctuating prices, the data tabulated are only approximate, but they are sufficiently accurate for comparative purposes and should vary only slightly for different types of ground. The cost of the sampling machine (approximately $500) is not included.

## SATELLITE EUROPE'S PRINCIPAL MINERAL DEPOSITS AND IRON AND STEEL CENTERS

- ♦ COAL
- ○ LIGNITE
- ◐ PETROLEUM
- Ⓖ NATURAL GAS
- ■ IRON ORE
- ◓ CHROME ORE
- ◩ MANGANESE ORE
- ▲ BAUXITE
- ▼ COPPER ORE
- △ LEAD-ZINC ORE
- ⊠ ANTIMONY
- ◠ PITCHBLENDE
- □ MAGNESITE
- ⊖ POTASH
- × IRON AND STEEL CENTERS

**Table 1. Mineral production in the European satellites, 1937 and 1947-51**

| Commodity | Units | 1937* | 1947 | 1948 | 1949 | 1950 | 1951 |
|---|---|---|---|---|---|---|---|
| Petroleum | Million barrels | 57 | 42 | 47 | 47 | 50 | 55 |
| Coal | Millions of metric tons | 57 | 79 | 93 | 96 | 101 | 105 |
| Lignite | do | 130 | 143 | 154 | 165 | 172 | 180 |
| Bauxite | Thousands of metric tons | 540 | 340 | 400 | 400 | 400 | 400 |
| Copper, mine production** | do | 18.0 | 16.0 | 16.5 | 17.0 | 17.5 | 19.0 |
| Lead, mine production** | do | 31 | 21 | 24 | 23 | 24 | 24 |
| Zinc, mine production** | do | 115 | 74 | 88 | 85 | 87 | 88 |
| Iron ore** | Millions of metric tons | 1.2 | .8 | 1.0 | 1.1 | 1.2 | 1.3 |
| Pig iron | do | 3.6 | 2.8 | 3.4 | 4.0 | 4.2 | 4.9 |
| Crude steel | do | 6.5 | 4.8 | 6.0 | 6.8 | 8.0 | 9.3 |
| Cement | do | 4.4 | 4.4 | 5.2 | 6.5 | 6.6 | 6.8 |

Data for 1937 and 1947-49 are taken mainly from Bureau of Mines *Minerals Yearbook*, supplemented by estimates by the author; figures for 1950-51 are estimates. Estimates are based on Communist announcements of the degree of attainment of production targets, United Nations statistics, and other published data.

* Data for prewar territorial boundaries, including estimates for the present areas of East Germany and the Soviet Zone of Austria.

** Recoverable metal content.

# Satellite Europe's Mineral Position

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A PROGRAM OF INDUSTRIAL expansion, directed by Moscow, is being carried on in the Soviet-dominated countries of Europe — Albania, Bulgaria, Czechoslovakia, East Germany, Hungary, Poland, Rumania, and the Soviet Zone of Austria. The progress apparently made so far amounts to an industrial revolution, which, in the future, will mark a transition from the traditional agrarian economy of the region to one in which heavy industry is destined to play an increasingly important part.

While the Soviet blueprint emphasizes the need for an overall increase in mineral output in the captive states, each of the countries concerned has been assigned special roles in the expansion of the mineral economy of the satellite area as a whole. Albania is to increase petroleum output and develop its chrome and copper resources; Bulgaria is to expand its production of iron ore and manganese; Czechoslovakia and Poland are to be the principal steel makers. East Germany is to increase its output of copper and lignite and, with Czechoslovakia, is to become a major supplier of mining machinery and capital equipment. Hungary is to expand aluminum output; Poland, to increase its production of coal, coke, pig iron, crude steel, lead, and zinc. Rumania, the oil barrel of the satellite group, is to concentrate on the output of petroleum and natural gas; and the Soviet Zone of Austria is also to expand its production of petroleum.

Development of heavy industry in the satellite area is of major strategic importance to the Soviet high command, inasmuch as it provides armament maintenance and production facilities in the potential war zone in event of an offensive war against the West.

The economic plans prepared by the individual members of the satellite group have been closely integrated with the Master Plan, and their implementation is in the hands of COMECON, the Soviet-controlled Council for Mutual Economic Assistance.

## Evaluation Difficult

A precise evaluation of the progress made toward realization of these plans is impossible for an outsider. Reliable statistical information is lacking. Communist statistics, while never pessimistic, are presented in a manner intended to confuse. Production data are not stated quantitatively but as percentages of planned targets, and the figures upon which these percentages are based are not made public. Furthermore, the countries concerned do not now have the same territorial boundaries they had before World War II; and consequently, comparisons between prewar and postwar years are not necessarily as indicated by the statistics. The data presented in this study, insofar as they relate to the postwar period, are estimates based in part on the degree of attainment of planned goals, as announced by the countries concerned; therefore they may be regarded in some cases as over-optimistic.

Production of key items in the mining and metallurgical industries of the entire satellite region in 1948-51 is shown in Table 1. Although output changes have not been uniform for all commodities, the general trend has been upward. Mineral production in this region in 1951 was substantially higher than in 1937. Owing to the lack of adequate statistics, it is impossible to determine accurately the wartime peak outputs for the region as a whole; but it is believed that the maximum production achieved has not been attained in the postwar era.

Distribution of the principal minerals among the satellite countries is shown in Table 2. This also gives the self-sufficiency of the satellite group in important mineral commodities in 1951. Satellite Europe's mineral self-sufficiency during 1951 for selected commodities, expressed as a percentage of

## Table 2. Self-sufficiency of satellite group in important mineral commodities, 1951

LEGEND

1. Surplus supply
2. Adequate supply
3. Inadequate supply
4. No appreciable supply

| Commodity | Albania | Bulgaria | Czechoslovakia | East Germany | Hungary | Poland | Rumania | Soviet Zone of Austria | Satellite region as a whole |
|---|---|---|---|---|---|---|---|---|---|
| Coal | 4 | 3 | 1 | 3 | 3 | 1 | 3 | 4 | 1 |
| Lignite | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 3 | 1 |
| Petroleum | 1 | 4 | 3 | 4 | 3 | 3 | 1 | 1 | 1 |
| Aluminum | 4 | 4 | 4 | 4 | 2 | 4 | 4 | 4 | 3 |
| Bauxite | 4 | 4 | 4 | 4 | 1 | 4 | 3 | 4 | 1 |
| Antimony | 4 | 4 | 1 | 4 | 3 | 4 | 4 | 3 | 2 |
| Chromium | 1 | 1 | 4 | 4 | 4 | 4 | 4 | 4 | 3 |
| Copper | 1 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 3 |
| Iron | 3 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Lead | 4 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | 3 |
| Manganese | 4 | 1 | 3 | 4 | 3 | 3 | 3 | 4 | 3 |
| Mercury | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 3 |
| Nickel | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Tin | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 3 |
| Tungsten | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 3 |
| Zinc | 4 | 4 | 3 | 4 | 3 | 1 | 3 | 4 | 3 |
| Graphite | 4 | 4 | 1 | 4 | 4 | 4 | 4 | 1 | 2 |
| Magnesite | 4 | 4 | 1 | 4 | 4 | 3 | 4 | 4 | 1 |
| Phosphate (Basic slag) | 4 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 3 |
| Potash | 4 | 4 | 4 | 1 | 4 | 3 | 4 | 4 | 1 |
| Pyrites | 4 | 1 | 3 | 3 | 3 | 3 | 3 | 4 | 3 |

its ability to meet consumption requirements, is as follows:

| Commodity | Percent |
|---|---|
| Solid fuels | 100 |
| Petroleum | 100 |
| Bauxite | 100 |
| Iron | 30 |
| Copper | 25 |
| Lead | 60 |
| Zinc | 100 |

In evaluating the mineral self-sufficiency, we must bear in mind that cost norms, as interpreted by western countries, lack significance. Submarginal deposits frequently are operated at a loss solely to decrease dependence on outside sources. Further, use patterns that depart from those of the western world may be imposed because of insufficiency of some of the mineral supplies. The information so far published indicates that, though no one of the captive countries has even a moderate degree of self-sufficiency, the region as a unit was reasonably well supplied in 1951, except for iron ore, ferroalloy materials, copper, and lead. These shortages loom as major strategic and economic weaknesses of the satellite group.

## How Does the Group Stand?

The situation with regard to the major mineral commodities is summarized briefly as follows:

**SOLID FUELS.** Satellite Europe has abundant resources of hard coal. Reserves are estimated at 220-billion metric tons, of which 24-billion tons is coking coal. Total coal reserves of the region are about the same as those accredited to the Ruhr district of Western Germany, but the proportion that will coke is only about 17% of that estimated to be available in the Ruhr.

Of the captive areas, the Ostrava Karvinna district of Czechoslovakia provides the best-quality coking coal, although its reserves of this class, estimated at 4-billion tons, are only 20% of those attributed to Poland. Czechoslovakia also has coal deposits of the noncoking type in the Kladno and Plzen areas. Hard-coal reserves, including coking coals, in Czechoslovakia, total 28-billion metric tons. Prewar Poland had little coking coal in the Upper Silesian area; but since World War II, it has acquired the Lower Silesian district, which furnishes most of the coking coal of former eastern Germany. Poland also obtained the German portion of the Upper Silesian Basin, which contains some coking coals. The Upper Silesian Basin is one of the greatest coal basins in the world, with numerous and some very thick seams of high-quality industrial and gas coals. Reserves of Polish coals are estimated at 193-billion tons, of which 10% is coking coal. Hungarian reserves are placed at 113-million tons, 18% of which is coking coal; and Rumanian reserves are estimated at 48-million tons, of which 20% will coke.

Production of hard coal in Poland in 1951 is estimated at 82-million metric tons, and Czechoslovak output for that year was about 18-million metric tons. The remaining production in the satellite region came from Hungary, Rumania, East Germany, and Bulgaria.

In addition to the hard coal, there are very large deposits of lignite and brown coal in East Germany and Czechoslovakia, with smaller quantities in Poland, Bulgaria, Rumania, and Hungary. Known and probable reserves are estimated at 17-billion metric tons in East Germany, 12-billion metric tons in Czechoslovakia, and 25-billion metric tons in the remaining areas. Lignite production in East Germany in 1951 is estimated at 125-million metric tons. Czechoslovakia produced about 29-million tons in that year. Albania, Bulgaria, Hungary, Poland, and Rumania provided the remaining 25-million tons. The planned output of lignite for the satellite area is reported to be 290-million tons in 1954, mainly from East Germany.

The satellite group exported an average of 11-million tons of hard coal annually to Western Europe during 1948-51. The bulk of these shipments was supplied by Poland, with a small quantity from Czechoslovakia. Current hard-coal shipments from the satellite region to the U.S.S.R. are estimated to have reached 9-million metric tons in 1951, virtually all of which came from Poland. Czechoslovakia has been supplying brown coal to Western Europe at a rate of about 1-million tons per year since 1947; most of the deliveries have been to West Germany.

## Oil and Gas Reserves Large

**PETROLEUM AND NATURAL GAS.** The satellite area has substantial oil and gas resources. The proven oil reserves of Rumania, estimated at 3-billion bbl., rank

**Table 3. Estimated metal smelting and refining capacity of satellite group**

| Commodity | Estimated annual capacity, 1951 | Principal participating countries |
|---|---|---|
| Pigiron | 5 million tons | Czechoslovakia, East Germany, Poland, Hungary, and Rumania |
| Steel | 10 million tons | Czechoslovakia, East Germany, Poland, Hungary, Rumania |
| Copper | 40,000 metric tons | East Germany, Albania |
| Lead | 70,000 metric tons | Poland, Rumania, East Germany, Czechoslovakia |
| Zinc | 200,000 metric tons | Poland, Czechoslovakia |
| Aluminum | 30,000 metric tons | Hungary |

second only to the U.S.S.R. in Europe. The bulk of the former petroleum-producing areas in Poland was incorporated into the U.S.S.R. after World War II, but small or moderate Polish production is now obtained from a number of rather small, scattered fields. Indicated petroleum reserves in Poland are estimated at 12-million bbl. Petroleum developments in the Soviet Zone of Austria, although of relative recent origin, are becoming increasingly important because of the intensive exploitation under Russian occupancy. Indicated reserves are estimated at 150-million bbl. Reserves in Hungary amount to about 50-million bbl., and in Albania reserves are estimated at 30-million bbl. Production from these areas, while small, nevertheless contributes to the overall supply. The estimated output of crude petroleum during 1951 for the producing countries of the satellite region is given as follows:

| Country | Thousands of Bbl. |
|---|---|
| Albania | 3,000 |
| Czechoslovakia | 300 |
| Hungary | 4,000 |
| Poland | 1,200 |
| Rumania | 32,000 |
| Soviet Zone of Austria | 14,600 |
| Total | 55,100 |

The 1955 production goal for crude petroleum in the satellite area is set at 91-million bbl., but lack of drilling equipment and tubular goods makes realization doubtful. Consumption of petroleum and petroleum products among the satellites has been forcibly curtailed in recent years to provide exports to the U.S.S.R. In 1950 these exports are estimated to have totaled 35-million bbl.

Hungary and Rumania have extensive natural-gas fields, which are currently being developed. A small production is also obtained in Poland, Czechoslovakia, and the Soviet Zone of Austria.

A number of synthetic-oil plants erected by the Nazis in East Germany, Poland, and Czechoslovakia are in operation; and new plants are under construction. It is planned that by 1954 the satellite area will be in position to supply over 9.8-million bbl. of synthetic fuel annually.

## High-Grade Iron Ore Lacking

**IRON AND STEEL.** A serious weakness of the satellite group is the lack of high-grade iron ore. Probable reserves of the principal iron-ore deposits are estimated at 660-million metric tons, averaging 34% iron content. The most important deposits are in Czechoslovakia and Poland. Of these, Czechoslovakia has 364-million tons, averaging 34% iron; and Poland has 147-million tons, averaging 29% iron. In addition, Hungarian reserves are placed at 24-million tons, containing 39% iron; Rumania has 45-million tons, containing 45% iron; and East Germany has 80-million tons, averaging 35% iron. Deposits of lesser importance are also found in Bulgaria and Albania. In 1951 Czechoslovakia is estimated to have produced 1,600,000 metric tons and Poland 800,000 tons of iron ore. The remaining production has come from Bulgaria, Hungary, East Germany, and Rumania.

Satellite countries are also short of materials for ferro-alloys. The principal source of manganese in the region is manganiferous iron-ore deposits in Czechoslovakia, which average 17% manganese. A small production is also obtained from Bulgaria, Hungary, and Rumania. Mine production in the satellite region in 1951 is estimated at 70,000 tons of manganese metal. The bulk of the output was from Czechoslovakia. Minor quantities of chrome ore are produced in Albania and Bulgaria, and a small quantity of tungsten is obtained in Czechoslovakia and East Germany. No other ferro-alloy materials are obtained in the region.

The principal pig-iron and steel-producing countries are Czechoslovakia, Poland, East Germany, and, of less importance, Hungary and Rumania. Production of pig-iron in 1951 is estimated to have been about 2-million tons in Czechoslovakia and 1,800,000 tons in Poland. Crude-steel output in that year was about 3-million tons in Czechoslovakia, 2,750,000 tons in Poland, and 1,750,000 tons in East Germany. According to United Nations estimates, 700,000 metric tons of ferrous scrap from outside the steel industry was apparently collected by the satellite nations in 1951.

According to present economic planning, the goal for the captive countries has been set at an annual output of 16.5-million tons of steel by 1955. In addition to existing and expanding plants, new facilities are in process of construction, to be completed before 1955. These plants are being erected at Furstenberg-on-the-Oder and in Brandenburg, both in East Germany; in the vicinity of Moravska Ostrava and near Koscice in Czechoslovakia; at Dunapentele in Hungary; and at Czestochowa and at Nowa Huta near Krakow in Poland. Another series of large steel mills is planned for construction in East Germany and Poland after 1955. The Soviet intends to develop the steel-making capacity of the satellite area to exceed that of the Ruhr. The eventual industry will depend primarily on foreign ore.

## A Deficiency in Copper

**NONFERROUS METALS.** Except for aluminum ore, antimony, and zinc, the satellite area is poorly endowed with supplies of the major nonferrous metals. Hungary has deposits of high-grade bauxite estimated at over 250-million tons. Bauxite is also found in Rumania; reserves are estimated at 20-million tons. Hungarian bauxite output in 1951 was about 400,000 metric tons; Rumanian output is believed to be small or nonexistent. Aluminum production in the satellite region was not large before World War II, but in the postwar period it has been expanded. Aluminum output in 1951 was about 20,000 metric tons, virtually all from Hungary.

Zinc deposits in Upper Silesia, among the most important in the world, are now entirely under

Polish control. Total ore reserves are estimated at 13-million metric tons, containing 15% zinc and 2.5% lead. By-product cadmium from these ores is of considerable importance. Lead is obtained as a coproduct from zinc mining in Poland. Lead-zinc ores are also mined in Czechoslovakia, Rumania, and Hungary. Czechoslovak reserves are estimated at 900,000 metric tons of ore, averaging 2.5% lead and 1% zinc. Rumania has some production of lead, and Hungary is known to have small deposits of lead ore. Mine production of zinc metal in 1951 is estimated to be 86,000 tons from Poland and 2,000 tons from the other satellite producers. In 1951 mine production of lead is estimated at 20,000 metric tons from Poland and 4,000 tons from the remaining producers.

## Copper From Mansfeld

The satellite area is deficient in copper. At present the largest production is from the Mansfeld area in East Germany, where ore reserves are estimated at 8-million metric tons, containing 2.5% copper. A few thousand tons of copper is also being produced annually in Albania, and other low-grade deposits occur in western and central Poland and in Rumania. Copper production in 1951, virtually all from East Germany, with a minor output from Albania, is estimated at 19,000 metric tons.

Czechoslovakia is the second-largest producer of antimony ores in Europe, and output in 1951 is estimated at 1,500 metric tons of recoverable metal. Production of silver, primarily as a by-product of smelting the principal nonferrous metals, is significant in Czechoslovakia and Rumania; output in 1951 is estimated at 2,115,000 fine troy oz. for the satellite region. Czechoslovakia and East Germany are important sources of supply of uranium ore to the U.S.S.R., and many thousands of workers are employed in its mining and treatment. As far as other nonferrous metals are concerned, production has minor significance.

The satellite region is well-supplied with the common construction materials, including materials and facilities for manufacturing hydraulic cement. Poland and Czechoslovakia are the principal cement producers; output in 1951 was estimated at 2,500,000 metric tons and 1,900,000 tons, respectively. Other significant producers are Bulgaria, East Germany, Hungary, and Rumania. The supplies of limestone and dolomite for chemical and other purposes are adequate and widely distributed.

No natural nitrates are found in the region for the manufacture of mineral fertilizers, but there is an adequate production of synthetic nitrogenous materials. A greater part of the immense potash deposits of the former German Reich occurs in East Germany. Production in 1951 is estimated at 1-million metric tons of equivalent $K_2O$. There are also potash deposits in Poland, but production from this source is not expected before 1952 or 1953. No important deposits of natural phosphates are known in the satellite region. However, the substantial output of basic slag obtained in conjunction with steel production is a major indigenous source of phosphorus.

Extensive deposits of high-grade magnesite are found in Czechoslovakia, where production in 1951 is estimated at 200,000 metric tons. There are substantial graphite deposits in Czechoslovakia, from which 1951 output was around 15,000 tons. A portion of this output is of crucible grade. The high-quality china-clay deposits of Czechoslovakia are also important. Fire clays are found in several places throughout the region, mainly associated with the coal deposits.

The principal salt-producing areas are in the vicinity of the potash deposits in East Germany, southwestern Poland, Hungary, and Rumania; but these are not adequate to meet satellite requirements. The area receives substantial imports of salt from the U.S.S.R., mainly from the former Czechoslovak province of the Sub-Carpatho-Ukraine.

Virtually all of the sulphur supply from the region is obtained from treatment of pyritic ores found in Poland, Czechoslovakia, East Germany, Bulgaria, and Rumania. A further supply will be made available upon completion of a new plant to extract sulphur from anhydrite in Poland. Other nonmetallic minerals are either absent or of minor importance.

## Smelting and Refining Capacity Adequate, With Exceptions

Estimated annual capacity of the satellite area for refining petroleum in 1951 was 56-million bbl. Rumania, Hungary, and the Soviet zone of Austria are the principal producing areas.

The estimated metal smelting and refining capacity in the satellite area is given in Table 3.

The data given indicate that, except for copper and aluminum, the satellite area has adequate smelting and refining facilities to meet its peacetime needs. Plant construction, now reported in progress, is presumably geared to foreseeable future requirements.

The contribution of the European satellites, expressed as a percentage of the overall 1951 production of the U.S.S.R. plus the satellites, is shown below:

| Commodity | Percent |
|---|---|
| Coal and lignite | 50 |
| Petroleum | 17 |
| Crude steel | 23 |
| Pig iron | 19 |
| Cement | 37 |

A similar comparison between the output of the satellite group and the non-Soviet bloc countries of Europe in 1951 is shown below:

| Commodity | Percent |
|---|---|
| Coal and lignite | 34 |
| Petroleum | 76 |
| Crude steel | 14 |
| Pig iron | 10 |
| Cement | 15 |

## Outside Sources Contribute

The satellite nations depend heavily on outside sources for iron ore, ferro-alloy materials, most of the nonferrous metals (particularly copper and tin), natural fertilizers, and sulphur. Equipment used in the mineral industries has largely been obtained from foreign sources in the past. Currently, the U.S.S.R. is supplying such material. Present economic plans provide that the area eventually will become virtually self-sufficient, with East Germany and Czechoslovakia the principal suppliers of deficient mining-material commodities. Imports of mineral commodities have shown an upward trend in the post-World War II period. Foreign purchases would have risen in 1951 substantially above 1948, had it not been for increased reliance on the U.S.S.R. as a supply source because the western-nation exports to the Iron Curtain countries were drastically reduced.

The principal retarding factors to expansion of the mining and metallurgical industries in the satellite area during the postwar period have been the shortage of labor, particularly skilled workers and supervisors; obsolescence of ma-

chinery and equipment; and reduced morale, caused by "sweatshop" working conditions. In the mining sector, a continuing difficulty in labor-supply problems has been the gradually rising average age of the miners. Not the least of the difficulties experienced in expanding output are the confusion, inefficiency, and self-generated bottlenecks omnipresent in planned economy.

### Increased Production Expected

Although the economic plans proposed by the satellite countries all appear to be over-ambitious, especially in view of the huge capital and labor requirements necessary for their fulfillment, it would be a mistake to underrate the progress possible under police-state methods. Having full control of currency and fiscal matters and the ability to impose taxes and compel "voluntary" loans at will, capital requirements can always be met. Under fear of reprisals, labor has no choice but to produce; and, while quality of production may suffer, output can be maintained at a rising rate, at least on a short-term basis. The satellite area as a whole has within its borders adequate reserves of the more-common mineral raw materials and consequently may be expected, especially under pressure, to continue to increase its industrial output. The Soviet drain on mineral resources and goods of the satellite countries may be expected to act as a brake on sound industrial growth. It is believed, however, that heavy industrial development in the region will remain a permanent accomplishment, to a greater or less degree, when the Iron Curtain is lifted.

I wish to express my thanks to E. W. Pehrson, director of the Foreign Minerals Region, Bureau of Mines, and to C. E. Nighman and various commodity specialists of the Bureau for advice and guidance. Use of information from publications of the Bureau and the United Nations, as well as an article by Jan Wszelaki, "The Rise of Industrial Middle Europe," *Foreign Affairs*, October, 1951, is gratefully acknowledged.

# Diesel Locomotive Found Useful for Development

MODERN GOLD MINING practice has made it necessary to improve existing methods of handling ore and waste during the development stage of a mine. Blasting occurs in a high-speed development heading as often as six times per 24 hours. Broken rock must be removed quickly and efficiently. The following account of the means adopted in one case is abstracted from the June issue of *Optima*, the quarterly review published by Anglo American Corporation of South Africa, Ltd.

When development headings are being rushed through, it has been found convenient to employ diesel-powered locomotives for transport. Diesel units are flexible; they do not require charging stations; and they are completely self-contained. If a suitable type is chosen, servicing is relatively simple. Originally, when high-speed development started on the new Orange Free State mines, three 3½-ton diesel locomotives were used to clean out a heading; but, as the heading advanced further from the dumping point, the operation became less efficient and a 10-ton diesel locomotive was provided to pull a larger load at a greater speed to cut down the delays due to transport difficulties.

The 10-ton locomotive is fitted with a four-cylinder, four-cycle diesel engine of the cold-starting type, rated at 65 hp. at 1,700 rpm. The engine is designed to consume standard fuel at the rate of about 0.4 lb. per bhp. hr. Maximum engine speed has been limited to 1,700 rpm for maintenance purposes and to prolong engine life. A mono-block type four-cylinder fuel pump is employed, with a hand-priming attachment for starting in very cold conditions. The engine is fitted with a decompression device for normal hand-starting. An air compressor and receiver are provided for operating with air brakes. A hand brake is also fitted. Lights are supplied from a dc generator driven from the engine; a storage battery is not used. The main drive of the unit is through a clutch and multi-speed gearbox; and the transmission to the main driving wheels, of which there are four (23 in. in dia.), is by external connecting rods. The overall dimensions are 12 ft. 9 in. long and 5 ft. high. The wheelbase is 4 ft. 3 in.

The locomotive frame is made from a high-duty iron casting with lifting holes at each end. The locomotive operates in either direction, the driver having a clear vision each way. There are two speeds—4½ and 9 mph—which have proved very satisfactory.

The locomotive is fitted with an exhaust-gas conditioner. This is a welded box made of stainless steel and is located within the frame at the front. This conditioner arrests large quantities of free carbon in the chamber, liberated during combustion and helps to cool the gas. If the engine is properly serviced and in good condition, the amount of carbon monoxide liberated can be disregarded; it will not pollute the mine air.

Fifteen 5-ton drop-bottom mine cars per trip have been handled by this 10-ton locomotive. The crew consists of a native driver and a native guard, who control the operational details, such as making up the train prior to dispatch to the dump and ensuring that the regulations laid down by the mine management are carried out. These natives are given a comprehensive test when examined for locomotive drivers' certificates issued by the resident engineer. They are required to know where the locomotive is to be oiled and greased; where water is to be added; when brakes are to be adjusted; and how to keep the unit clean.

It has been found that a very strict maintenance schedule must be observed. Daily inspections are made by the European in charge of maintenance.

Fuel oil conditioning is an important factor. The oil used in the 10-ton locomotive is fed through a chamois leather filter before entering the main tank, and is not allowed to be fouled by any abrasive substance. The tank is fitted with a soft and hard-core felt filter, through which the oil passes before entering the main filter on the engine itself. In this way clean fuel oil is fed to the injection system. If the injection system is kept in perfect condition, the incidence of black smoke from the exhaust is held to a minimum, and the objectionable conditions resulting from bad maintenance are eliminated.

A disadvantage in using diesel locomotives underground is that heat is liberated during operation and dispersed into the ventilation system. Ventilation must be good.

# Can the U.S. Use Its Low-Grade Domestic Chrome Ore?

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THE UNITED STATES consumed nearly a million tons of chromite ore in 1950 and considerably more than that amount in 1951. Domestic production is negligible (1920-40 average, 288 tons); war demands and federal subsidies stimulated a record output in 1946 of only 160,120 tons of chromite ore.

Chromite is used to produce chromium chemicals. These chrome products, especially ferrochrome, are indispensable to our economy. It would be a serious blow if foreign supplies were cut off. In the face of this possibility the U. S. Bureau of Mines carried out extensive investigations of measures required to utilize domestic chrome ores.

## What Are Our Chrome Resources?

A SURVEY OF DOMESTIC CHROMITE deposits reveals numerous small and dispersed bodies of fairly good ore, none of which appear to be capable of yielding significant amounts of marketable products at reasonable costs. To encourage development of such deposits and to supplement a stockpile of chrome ore, the General Services Administration established a receiving depot at Grants Pass, Ore., and offers $115 per ton for chrome ore that meets standard metallurgical specifications, with penalties and bonuses for certain deviations. This offer of more than twice the market price is limited to 200,000 tons of ore delivered before July 1955, and to a maximum of 5,000 tons per year from any single mine, mining development, or mining facility.

Of all our domestic chrome deposits, only those in Stillwater and Sweetgrass Counties, Mont., are known to contain large bodies of ore that can be mined economically by nonselective methods. Unfortunately these ores are not only low-grade, but will not yield concentrates of standard metallurgical grade by any known ore-dressing treatment.

The mineral, chromite, can vary in chemical composition from a theoretical $Cr_2O_3.FeO$ (68% $Cr_2O_3$) to a chrome spinel ($Al_2O_3.MgO$) containing less than 40% $Cr_2O_3$. Chromite minerals in many ores assay 50 to 60% $Cr_2O_3$ and are easily sorted or concentrated to the standard 48% grade for metallurgical use; but clean specimens of chromite selected from Montana ores assay not more than 45% $Cr_2O_3$ and ordinary milling operations yield concentrates that assay about 40% $Cr_2O_3$.

As a source of ferrochrome, Montana chromite concentrates are handicapped also by a very low chrome-iron ratio and a pulverized state that is unsuited to smelting. The steel industry has become accustomed to ferrochrome containing about 70% chromium, produced by smelting high-grade lump ore. Producers of ferrochrome usually reject ores that contain less than three parts of iron because this ratio affects the grade of the product and smelting costs. Lump ore is demanded because large reduction furnaces do not operate satisfactorily when fed granular material such as a mill concentrate.

Cost of producing Montana concentrates was reported to be $35 to $39 per ton by Anaconda Copper Mining Co. Acting as agent for Defense Plant Corp., the company expended $12-million during World War II to develop orebodies in the Mouat and Benbow mines (near Nye, Mont.) and to install trams, roads, housing and two large mills. The latter were designed to treat 2000 and 1000 tons daily, but only three 500-ton units were installed, and these were not operated at full capacity or high efficiency. When imports of chrome were restored in 1943, the mills were shut down and dismantled after producing only 102,104 tons of concentrates. Costs might be reduced to $30 or less in a continuing stabilized operation. However, the concentrates do not meet present specifications for any of the three major uses and are not regarded as saleable in competition with imported ores.

## Can Domestic Ores Be Upgraded?

NUMEROUS CHEMICAL and electrolytic methods have been investigated in persistent efforts to upgrade domestic chrome concentrates or to utilize them to produce more saleable finished products. The Bureau of Mines has had success in pilot-plant development of an electrolytic process by which chromium metal of very high quality is derived from domestic ores. The Bureau also has shown by comparative tests that chromate salts can be produced by standard methods from Montana chromite with an efficiency only slightly less than is attained when imported chemical-grade ore is treated.

The chromium content and the chrome-iron ratio of an off-grade concentrate can be raised to desired value by adding chromic oxide produced from a portion of the ore by some chemical process. The grade and ratio can be improved also by partial reduction and acid leaching, or by selective chlorination at high temperature, to extract part of the iron. However, these chemical operations are expensive when compared with the cost of smelting to produce ferrochrome or with the cost of imported ore. Upgraded material also must be consolidated in lump form by nodulizing or briquetting before it can be smelted satisfactorily to produce ferrochrome in commercial furnaces.

Economic relationships in upgrading were studied during 1950 when the American Chrome Co. of San Francisco acquired a long-term lease on the Mouat chrome mine and purchased land and buildings with the intention of re-equipping the property for production under a long-term contract with the federal government. Since the con-

centrates do not meet minimum specifications for metallurgical ore the contract would involve substandard specifications or some arrangement for upgrading the concentrates. For this reason a request was made by American Chrome to the Bureau of Mines for information on upgrading.

Economic relationships can be clarified by referring to Table 2, listing General Services Administration schedules and market prices of various grades of chrome ore. Direct comparison with prices of ferrochrome, chromium metal and sodium dichromate is attained by converting all prices to cents per pound of chromium. Mouat concentrates with 40% $Cr_2O_3$ and a chrome-iron ratio of 1.5 to 1 don't meet minimum specifications but if penalty scales were extended, it would bring $41 per long ton or 6.8¢ per pound of chromium.

Market values per pound of chromium increase from 7.35 to 21.75¢ when the best metallurgical ore is converted to high-carbon ferrochrome, and from 4.30 to 31.5¢ when dichromate is produced from chemical grade ore. Although chemical upgrading can be accomplished with less expense and effort than are required to produce chromates, it appears that such operations are not economically satisfactory as an upgrading step to obtain a substitute for a normal high-grade ore.

## TABLE 1. Specifications and Uses for Chrome Products

| Constituent | Specifications Ferrochrome | Refractory | Chemical |
|---|---|---|---|
| $Cr_2O_3$ | 48% min. | ..... | 45% min. |
| $Cr_2O_3$ — $Al_2O_3$ | ..... | 57% min. | ..... |
| MgO — $Al_2O_3$ | 25% max. | ..... | ..... |
| MgO | ..... | 15% | ..... |
| Fe | ..... | 5% | ..... |
| Cr-Fe ratio | 3:1 | ..... | 1.6:1 |
| Si | low | 10% | 8% max. |

USES

Ferrochrome (45%)—Structural, tool, high speed, bearing and stainless steels.

Refractory (38%)—Neutral lining for steel furnaces.

Chemical (17%)—Pigments, tanning, surfacing metals, chromium metal for high temperature alloys.

## TABLE 2.—Prices on Chrome Ores and Products

| Schedule | % $Cr_2O_3$ | Cr/Fe | $/long ton [1] | Lb. Cr/ton | ¢/lb. Cr. |
|---|---|---|---|---|---|
| GSA | 48 | 3 | 115 | 735.7 | 15.63 |
| Do | 44 | 3 | 103 | 674.3 | 15.28 |
| Do | 42 | 2.5 | 82 | 643.7 | 12.74 |
| Do | 42 | 2.0 | 67 | 643.7 | 10.41 |
| E&MJ (Turkish) | 48 | 3 | 54 | 736 | 7.35 |
| Do—(Rhodesian) | 48 | 3 | 44 | 736 | 5.98 |
| Do—(Brazilian) | 44 | 2.5 | 32 | 674 | 4.75 |
| (Chemical)[2] | 44 | | 29 | 674 | 4.30 |
| E&MJ | Ferrochrome—high carbon | | | | 21.75 |
| Do | Ferrochrome—low carbon | | | | 30.5 |
| Do | Chromium metal | | | | 110.0 |
| Do | Sodium dichromate | | | | 31.5 |

[1] These prices apply to lump ore. Mill concentrates are penalized $5 per ton on GSA schedules.

[2] Chemical-grade ore. Cr-Fe ratio and physical state not specified.

Turkish ore commands a premium because its physical properties are especially suitable for smelting.

# But Is Upgrading Necessary?

SPECIFICATIONS for metallurgical chromite were established by ferrochrome producers on the basis of best available impartial ores, and these specifications need not be regarded as definitive. An investigation of the useability of ferrochrome obtained by smelting 40% concentrates demonstrates that the product is suitable for production of open-hearth alloy steel and probably an acceptable substitute for standard-grade ferrochrome in most uses. Preliminary correspondence and discussions with steel and foundrymen revealed that, in most instances at least, the ratio of chrome to iron in ferrochrome has little or no importance. It may be that a large amount of ferrochrome added to a ladle will cause undesired chilling and this effect will be increased by a large surplus of iron in the ferrochrome. However, only a minor amount of ferrochrome is added to the ladle, and the exothermic preparations such as Chrom-X are displacing standard grades of ferrochrome for ladle additions.

Five tons of ferrochrome were prepared from low-grade domestic ores by smelting concentrates in the Federal Bureau of Mines Electrometallurgical Laboratory at Boulder City, Nev. A 3-ton batch was prepared from typical mill concentrates obtained from the Mouat stockpile and a 2-ton batch from Oregon beach-sand concentrates. These were sent to the Republic Steel Corp. and tested in its Massillon steel plant as provided in a cooperative agreement. A report on these tests dated Dec. 22, 1951, was submitted to the Bureau of Mines by D. H. Ruhnke, chief metallurgist, Central Alloy District, Republic Steel Corp. Here's what one report says, revealing the potential value of domestic ferrochrome:

# Abstract from Republic Steel Report

"SIX SAMPLES taken from the 3-ton batch and another six from the 2-ton batch of special ferrochrome produced by the Bureau of Mines were analyzed. Average analyses of each batch are listed in Table 3 with an average of typical commercial high-carbon ferrochrome analyses for comparison.

"Visual examination of this special alloy revealed a considerable amount of fine acicular dendritic structure, apparently characteristic of this material. A small amount of adhering slag was noted on the surface of one sample. Metallographic examination revealed small, scattered oxide and silicate inclu-

**"The only significant difference between special ferrochrome (from domestic ore) and commercial ferrochrome is in the increased amount of special ferrochrome needed to raise the chromium content of a heat."**

sions in four of the twelve samples, typical for this type of alloy. This ferrochrome compares favorably with commercial material and appears cleaner microsopically.

"A total of six 100-ton heats of open hearth alloy steel was made by the Massillon open hearth meltshop, using the special ferrochrome obtained from the Bureau of Mines.

"The average percentage of chromium recovery for the six heats was 84.9%. This recovery compares favorably with recoveries obtained from high carbon ferrochrome supplied by commercial producers. Nonmetallic inclusion testing and etch tests on billet products revealed acceptable material from all of the heats. These tests all compare favorably with tests performed on heats using commercial high carbon ferrochrome.

"The only significant difference noted between the special ferrochrome and commercial ferrochrome is the increased amount of special ferrochrome needed to raise the chromium content of a heat. This was expected because the special alloy has a lower chrome content. The special ferrochrome differs somewhat in appearance from the commercial alloy and is much more difficult to fracture. These unimportant differences are attributed to the relatively small batches in which the special ferrochrome was smelted and cast, rather than the difference in chemical composition.*"

**TABLE 3.—Ferrochrome Analyses, Percent**

| | Cr | Si | C |
|---|---|---|---|
| U.S.B.M. 3-ton batch | 57.91 | 0.85 | 5.52 |
| U.S.B.M. 2-ton batch | 56.13 | .87 | 5.43 |
| Commercial ferrochrome | 69.58 | 1.63 | 4.62 |

The cost of smelting ferrochrome from the 40% concentrates cannot be estimated satisfactorily from data obtained in the small furnace used to produce material tested at Massillon. It may exceed the cost of smelting high-grade lump ore, first, because the granular concentrate must be consolidated by briquetting or nodulizing; second, because furnace capacity and the chromium reduced per kilowatt-hour may be affected by the chrome content and chrome-iron ratio of the material charged in the furnace.

An approximate cost for smelting high-grade lump chromite in commercial furnaces was estimated independently by several Bureau of Mines metallurgists at 7 to 8¢ per pound of chromium. This estimate does not include such indirect costs as marketing, or the cost of ore, and it is based upon very scanty data, but it is consistent with the spread between the market values of chromium in the ore and in the alloy product. As a limiting approximation we can assume smelting costs to be inversely proportional to the grade of ore in the range 40 to 48% $Cr_2O_3$.

The preceding estimates and the excellent results achieved in smelting low-grade ore make it quite apparent that the cost of smelting 40% Mouat concentrates will not exceed the cost of smelting upgraded 48% material by more than 1.5¢ per pound of chromium in the alloy. The difference may be less, and it is certainly small if compared to the cost of chemical beneficiation or to the 10¢ bonus offered by GSA for upgraded or high-grade products.

The cost of nodulizing either crude or upgraded concentrates to provide a charge suitable for smelting is estimated to be about 0.5¢ per pound of chromium. Freight charges from Columbus, Mont. to Pittsburgh, Pa. are approximately 2¢ per pound of chromium in the ferrochrome. Despite these undeniable handicaps, there is a possibility of competitive production of acceptable ferrochrome from 40% concentrates if mining, milling, and smelting are efficiently integrated in large-capacity units.

* Analyses made by the Bureau of Mines on separate samples of the special ferrochrome average about 55% Cr, a value in line with the chrome-iron ratio of the ore.

# Bureau of Mines Now Making Ductile Titanium

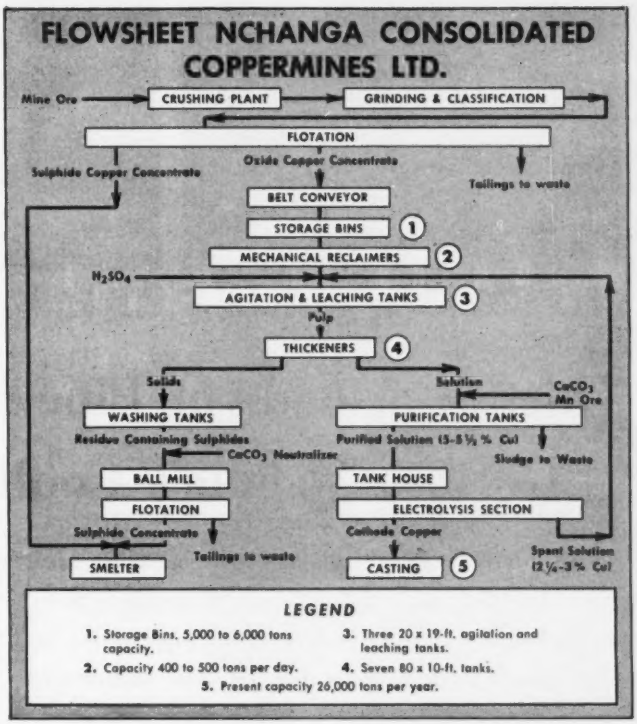
HOW TITANIUM METAL is made in 200-lb. batches at the Bureau of Mines station at Boulder City, Nev., is described in a Bureau Report of Investigations, 4879. The basis of the Kroll process, first reported by Wilhelm Kroll in 1940, is the reduction of titanium tetrachloride with magnesium in an inert atmosphere. The Bureau now uses helium to provide this. This process was chosen as most promising for development during the Bureau's early titanium studies.

After having increased the batches of metal produced from a few grams to 15 lb., and discovering that an unlined iron pot could be substituted for the molybdenum-lined vessel first used by Dr. Kroll, the Bureau transferred development to Boulder City in 1944. Major emphasis was placed upon regular production of a ductile metal of uniform grade for other phases of the titanium program and for providing samples to enable industry and research organizations to study the material. By 1949, titanium was being turned out in 100-lb. batches, and various process improvements had been made.

Doubling the size of the batch to 200 lb. yields more metal in the same working period and per square foot of working space, the report notes, although the reduction in cost has been insignificant. The most important innovation described is a so-called dry room, with an artificially dried atmosphere, where the reaction mass, composed of titanium and magnesium mixed with magnesium chloride, can be turned out without absorbing too much moisture. Then the crude titanium chips can be purified by vacuum distillation. The dry room also permits using other cost-reducing and labor-saving techniques.

# Nchanga's New Copper Leach Plant

**From a report by H. L. Talbot, consulting metallurgist in Northern Rhodesia for Anglo American Corporation of South Africa, Ltd., as presented in *Optima*, a quarterly review published by Anglo American Corp.**




CONSIDERABLE INGENUITY was required in designing the plant of Nchanga Consolidated Copper Mines, Ltd., in Northern Rhodesia where both oxide and sulphide copper minerals occur in the ore. Nchanga mine ranks as one of the world's largest known copper deposits. Ore reserves are shown in the accompanying table.

Principal ore minerals are chalcocite and malachite, plus minor quantities of chalcopyrite, bornite, azurite, cuprite, native copper, and chrysocolla. This mixture of oxides and sulphides necessitated the steps illustrated in the flowsheet shown here.

Note that the flotation section yields a sulphide concentrate which goes to the smelter, and an oxide concentrate containing 15 to 20% copper, of which 3 to 4% is in the form of sulphides. The leaching process extracts virtually all of the copper contained in the oxides, but the sulphide sludge must be treated by secondary flotation as shown.

**Leaching.** Since the mineral particles are very fine, chemical action by the acid solution in dissolving the oxide copper is fast, requiring only two to three hours. Leaching is done continuously in a series of three 20x19-ft. tanks in which the pulp is vigorously agitated. When dissolution is complete, the pulp is pumped to the clarification and washing section.

**Solution Recovery and Purification.** During leaching about 30% by weight of the original concentrate is dissolved, and the remaining 70% of residue is then separated from the copper-bearing solution. This step is carried out in seven 80 x 10-ft. thickeners. Leached pulp is delivered to the thickeners, where the solids settle out and are pumped out as a sludge. The clear solution overflows around the periphery.

Primary separation is carried out in three thickeners. Strong clarified solution, after purification, is delivered to the electrolysis tankhouse, while the solids proceed to the washing section. To control impurities (principally iron) dissolved with the copper during leaching, strong solution is diverted to tanks and agitated with finely ground limerock and manganese ore. Purified solution is separated from the pulp, and the sludge goes to waste.

Settled solids from the primary separation step contain entrained copper solution which is recovered by washing. Here the solids are passed in succession through four thickeners to which is added solution progressively lower in copper content, and finally fresh water.

**Residue treatment.** Residues from the leaching operation containing sulphide copper are retreated by flotation. The pulp is first neutralized with lime, and then ground lightly in a ball mill to insure release of sulphide particles. This sulphide concentrate then joins the normal sulphide concentrate for treatment in the smelter.

When present plant extensions are completed, Nchanga will have a capacity of about 130,000 short tons of copper per year, of which 40,000 tons of electrolytic copper will be the potential capacity of the leach plant. Present leach-plant capacity is 26,000 tons.

**ORE RESERVES. (Mixture of oxides and sulphides complicates recovery process.)**

| Property | Short Tons | Total Cu % | Oxide Cu % | Sulphide Cu % |
|---|---|---|---|---|
| Nchanga West | 43,000,000 | 6.99 | 3.03 | 3.96 |
| Nchanga River Lode | 2,280,000 | 4.21 | 2.92 | 1.29 |
| Chingola | 2,000,000 | 7.00 | 6.60 | 0.40 |
| Nchanga | 89,580,000 | 3.48 | 2.19 | 1.29 |

Note: Above reserves were published in as of April, 1951.

CARLOADS OF PIPE AND FITTINGS sorted and stacked on platforms receive paint coats before installation in shaft.

PIPES ARE SUSPENDED in shaft by means of heavy support band welded to pipe, and yoke with 2-in. bolt holes.

# Thirty Carloads of Pipe and Fittings Go into Magma's Cooling Plant

**Magma's modern cooling system was described in great detail in *E&MJ* Sept., 1951. The job of installing thousands of feet of extremely heavy-walled pipe in the No. 5 shaft was in itself a major project. The author tells how it was done.**

G. L. AUGUSTADT
Ventilation Engineer
Magma Copper Co., Superior, Ariz.

SPECIAL EQUIPMENT had to be designed to install the double high-pressure circulation column for cooling water in Magma's No. 5 shaft. Thirty carloads of pipe and fittings went into this cooling project. Normal length of pipe was 41 ft. 8 in. Below the 4,000-ft. level, wall thickness of pipe was 1 in. Each length weighed about 3 tons. Wall thickness of the 12-in. pipe at the top was 0.33 in. Diameter of pipe from the surface to the 3200-ft. level was 12 in., and 10 in. from the 3200 to the 4800-ft. level. Pipes were connected with lap joint flanges. Flange size increased as depth and pressure increased.

A 500 x 48-ft. platform was built on surface to aid handling and preparation of pipe. To prevent external corrosion, all pipes and fittings were treated as follows:

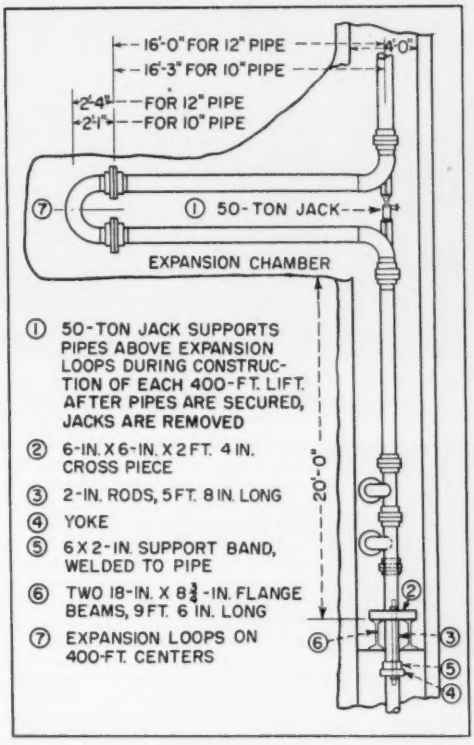
1. Sand-blast to clean exterior surfaces to bright metal.
2. One coat of Barretts water works pipe line primer.
3. Two coats Barretts water works coal-tar enamel at a temperature of 485 to 500 deg. F.
4. One layer spiral wrapped Johns-Manville coal-tar saturated asbestos felt No. 15.
5. One coat Barretts water works coal-tar enamel at a temperature of 485 to 500 deg. F.
6. One layer spiral wrapped Barretts coal-tar saturated pipe line fabric.
7. One coat Barretts waterworks coal-tar enamel at a temperature of 485 to 500 deg. F.
8. One layer spiral wrapped Kraft paper.

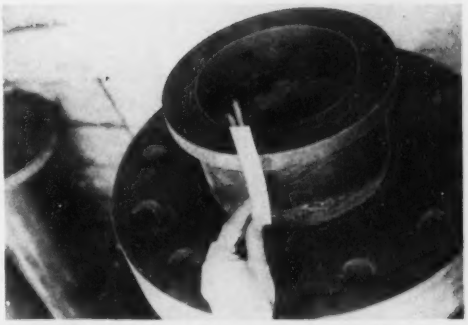
Pipe columns were suspended in a 4 x 5-ft. compartment of the shaft, which was timbered part way and concreted part way. Details of the expansion chambers and methods of hanging are shown on next page.

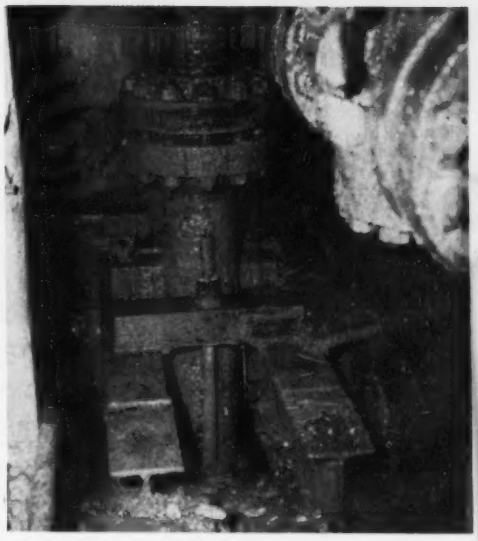
Since this compartment had no guides, two special cages were designed to operate in the compartment without guides. One cage served as a moveable staging on which men stood to assemble pipes. This cage was operated by a hoist. It had two floors, 6 ft. apart. The top floor, of ½-in. steel plate, contained two 26-in. holes with centers 2 ft. 4 in. apart (the distance between the two circulation columns). This plate was also cut to provide for two removable plates on 2 ft. 4 in. centers. These plates were bolted in place and were removed to pass the cage by the expansion loops in the columns. The bottom floor was made of three pieces of steel grating, hinged on one end. Men stood on this grating while bolting spiders onto the pipe. The cage frame consisted of angle irons, curved on top and bottom to prevent cage from hanging up on timbers while being raised or lowered.

The spider was made of ⅜ x 2-in. steel straps and 2 x 4-in. wood fillers, both drilled for bolts. These spiders bolted on the pipes kept the columns in correct position and served as support for the hoisting cage when disconnected from the hoisting cable.

Pipe crews rode on the top floor while the bolting cage was hoisted. All equipment was carried on this cage. During hoisting, the cage was stopped when the top floor reached


16'-0" FOR 12" PIPE
16'-3" FOR 10" PIPE
4'-0"
2'-4½" FOR 12" PIPE
2'-1" FOR 10" PIPE
⑦
① 50-TON JACK
EXPANSION CHAMBER
① 50-TON JACK SUPPORTS PIPES ABOVE EXPANSION LOOPS DURING CONSTRUCTION OF EACH 400-FT. LIFT. AFTER PIPES ARE SECURED, JACKS ARE REMOVED
② 6-IN. X 6-IN. X 2 FT. 4 IN. CROSS PIECE
③ 2-IN. RODS, 5 FT. 8 IN. LONG
④ YOKE
⑤ 6 X 2-IN. SUPPORT BAND, WELDED TO PIPE
⑥ TWO 18-IN. X 8¾-IN. FLANGE BEAMS, 9 FT. 6 IN. LONG
⑦ EXPANSION LOOPS ON 400-FT. CENTERS
20'-0"
②
⑥
③
⑤
④





**PIPES WERE INSTALLED IN SHAFT COMPARTMENT in 400-ft. lifts as shown above. Note use of yoke and suspension collar in drawing above and photograph at lower right. Expansion chambers were installed every 400 ft. Photo at upper right shows detail of Van Stone flange on a 10-in. dia. pipe.**

a point 3 ft. below flanges at the top of the assembled columns. Pins which secured the grating in an upright position were then pulled out, and the gratings (hinged at one end) were dropped against stops which held the grating floor in a horizontal position. The pipe crew would then pass through the opening between the pipe and the 26-in. dia. hole in the plate to the grating floor below. Then the spider was bolted on the columns, and the crew returned again through the same opening to the top floor. Gratings were then pulled up to a vertical position and secured. The bolting cage was then lowered until the top floor-plate was held by the spider and the hoisting cable disconnected from the cage. The crew then rode to the surface in the cage which was hanging in the compartment just above them, to lower two more lengths of pipe.

The pipe-lowering cage was made of a frame work of angle iron with 2-in. pipe on the outside, welded to the angle-iron frame. Two of these 2-in. pipes were welded onto each corner of the cage. The pipes extended above and below the cage and were curved inward on the ends. The ride through the compartment in the timbered sections was rough, but relatively safe, since the curved pipes bounced the cage away from the timber and prevented the cage from catching on the timber. The cage was not directly connected to the hoisting cable, but was supported on a 4-in. dia., ½-in. steel plate welded to the cable socket. The cable passed through a slot between two parallel angle irons at the top of the cage, down through a 1½-in. dia. pipe within the cage, and through a slot between two angle irons at the bottom of the cage. Two steel plates 4-in. dia. over the pipe and welded on both ends of the 1½-in. pipe against the angle irons, provided a cable guard and also added strength to the cage. The 1½-in. pipe fitted between the angle irons at the top and bottom of the cage. Parallel angle irons at both top and bottom of the cage, were also parallel to the line of the two columns in the shaft. Holes were drilled through the angle irons at 1 in. and at 1 ft. 2 in. on each side of the center of the cage. The cable was held in the center of the slot in the cage by bolts through the holes in the angle irons, while the pipes were being lowered in the shaft. The cage was stopped at a distance of about 50 to 60 ft. above the top of the columns. At this point the top cage was suspended in the compartment by a set of hangers which held the cage. These hangers were carried on the cage for use in the concreted and timbered sections of the shaft.

Four men and a supervisor made up a crew. One man remained in the

SIX COATS OF PROTECTIVE paint and enamel were applied. These are 8-in. pipes to heat exchangers.

DOZENS OF CANS of protective coal tar enamel were required to apply the protective coatings to the pipe.

top cage, and the rest climbed down to the bolting cage, at the top of the columns. The man in the top cage removed the bolt on the side to which the pipe had to be swung, to line up with the column on which it belonged. The cable holding the pipe was then moved horizontally in the slot between the two angle irons, to a point beyond the hole in the angle irons at 1 ft. 2 in. from the center position, and the bolt was then put through the angle irons to hold the cable in line with the column. It was then only necessary to rotate the pipe being lowered so that the stud bolts projecting through its bottom flange dropped through the holes in the flange at the top of the column. Two nuts for each bolt were turned onto the threads on the top end of each stud bolt. These stud bolts were dropped through the holes in the bottom flange of each pipe before each pipe was lowered from the surface. A corrugated copper gasket was placed and held up in the ring of stud bolts before the top pipe was lowered and bolted in place. These bolts were tightened just enough to secure the pipe to the column.

The cable was then allowed to slacken and spin on its swivel connection. A pin, chained to the cable socket, and connecting the socket and the pipe lowering head, was removed to free the cable. Next the hoisting cable was returned to the center position of the slot between the angle irons at the top and bottom of the cage, and a bolt placed through the angle irons to hold the cable at this center position. The hoisting cable was then pulled up until the 4-in. dia. plate on the socket contacted the bottom of the cage and raised it free of the hangers.

All bolts through flanges were

JUST A FEW of the numerous high-pressure 8-in. valves for heat exchanger lines.

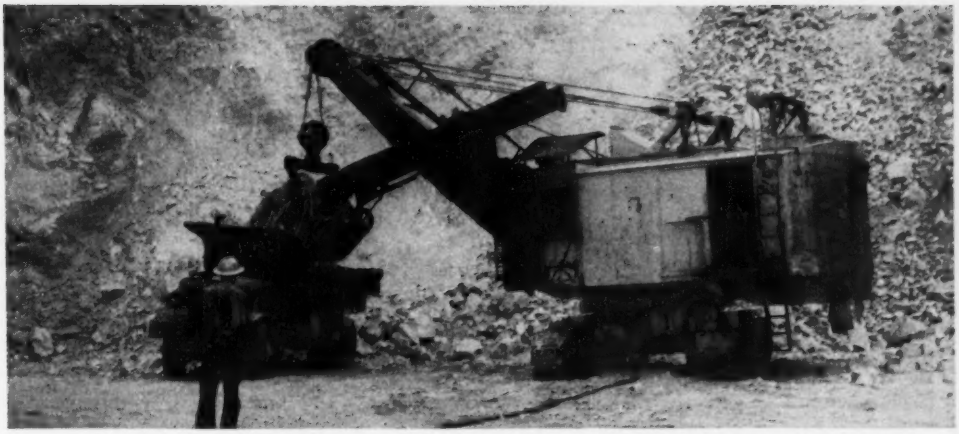
then tightened with air-operated impact wrenches. Flanges, bolts, and nuts were coal-tarred.

A track was laid in a slot through the pipe rolling platform on the surface and it extended down an incline tunnel parallel to the end of the shaft compartment. At the bottom of the incline, 60 ft. below the surface, where it met the shaft, the tunnel was driven horizontal for a distance of approximately 55 ft. beyond the shaft. Pipe was rolled off the platform, onto two dollies which were positioned on the track in the slot through the platform to match the flanges at the ends of the pipe. A hoist at the portal of the incline controlled descent of the pipe on the dollies down the incline track to the shaft. A platform was constructed at the bottom of the incline, parallel to the horizontal tracks, upon which to roll the pipe from the dollies. Two parallel rails, 9 in. apart on this platform, were at the same elevation as the top of the dollies. These rails cradled the flanges and provided a skid for pipe pulled into the shaft.

The pipe-lowering cage was suspended by its hangers in the shaft at approximately 50 ft. above the bottom of the incline, when the pipe was pulled into the shaft. After the cage was suspended on the hangers, the pipe-lowering head attached to the hoisting rope was lowered and bolted to the flange of the pipe on the skid. This pipe-lowering head was made of a 1-in. steel plate, 24 in. dia., which was drilled so that it could be bolted to any of the six different-sized flanges and fitted at its center with a swivel connection for attachment to the hoisting rope.

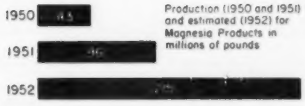
It was necessary to weld plates onto the right angle elbows of the expansion bends, so that the columns could be supported from the cross beams, up through the expansion loops while each 400-ft. section of the columns was being constructed. A 50-ton journal jack, set between the jack plates on each expansion loop, supported the pipes above the expansion loop during the construction of each 400-ft. lift. The 18-in. wide flange beams were installed and grouted with a mixture of sand and quick-setting early-strength cement, as soon as the columns extended above the elevation for the beams. The 6-in. x 6-in. x 2-ft. 4-in. crosspieces were laid across the beams and 2-in. hanging rods were inserted, which connected the pipe yokes to the crosspieces. Nuts on the hanging rods were then tightened, and the 50-ton jacks between the jack plates on the expansion elbows were removed. In this way each 400-ft. section of column was suspended and the jacks were brought up the shaft to the expansion chamber above.

Less than 36 working days, three shifts a day, were required to complete the construction of the two columns in the shaft. Not a single man was injured, nor did any leaks develop in completed columns.



"SELECTIVE SHOVELING" eliminates siliceous granitic impurities and upgrades dolomite.

# HMS Unit Improves and Increases Dolomite Production




**This tremendous resurgence in demand for magnesia products shows the need for greater production. Here is one producer who is stepping up the pace.**

STEADILY INCREASING DEMAND for magnesia products in the early part of last year, and the reactivation of a dormant magnesium plant spurred officials of the Natividad dolomite quarry of Kaiser Aluminum & Chemical Corp. to find new ways of increasing production. One of the things they did was to take a look at heavy density separation for beneficiating quarry output.

If successful, heavy density separation would improve grade and recovery as well as make possible the mining of ore-bearing areas previously rejected because of low yield and high content of siliceous and granitic impurities. Western Machinery Co. conducted tests which showed that the plan was feasible and a 250-tph Wemco prefabricated HMS unit was installed.

Current output at the Kaiser quarry northeast of Salinas, Calif., is nearly 45,000 tons of dolomite rock net to the calcine plant. The plant produces calcine for magnesia products, metallic magnesium, and for use in the steel industry.

The quarry proper is more than 800 ft. long and lies in dolomite of the Sur series, which is intruded by pre-Franciscan Santa Lucia granite. Dikes of decomposed dark granite, sills, and apophyses distributed irregularly through the deposit are the chief mining impurities. These make selective mining in some quarry areas difficult, but through careful shovel operation, or "selective shoveling" of broken material, a fairly uniform grade of ore can be sent to the primary crushing plant.

Rock mined is, in general, pure white, coarsely crystalline and massive. It is a dolomitic limestone rather than pure calcite like other deposits in the area.

Drilled and tested sections of the quarry are exploited by conventional open-pit methods. Benches are carried at heights ranging from 75 to 80 ft. Rotary well drills on trucks, using 9⅞-in. Hughes bits, drill blast holes at 30-ft. intervals, 30 ft. back from the bench face. An average round consists of two rows of holes, a total of 30 to 35 holes. Hercules Gelamite and the bag powder of 40% strength are used for blasting. A typical charge in an 80 ft. hole is 500 lb. of Gelamite, followed by a precalculated charge of bag powder, 15-ft. tamping, five cases of bag powder, and 10 to 15 ft. tamping. Loaded holes are shot with primacord and blasting caps.

Loading and moving broken rock from the quarry face 2,000 ft. to the primary crushing plant, takes a 2½-yd. Marion and a 4-yd. Bucyrus-Erie electric shovel plus a fleet of 12-yd. Euclid end-dump trucks and 12-yd. rear bottom dump buggies drawn by Caterpillar DW-10 tractors. Grades do not exceed 7%.

Operating officials at Natividad include D. M. Kerr, general superintendent who also directs operations at Moss Landing; J. D. Moore, plant superintendent; H. L. Bolan, production supervisor; Clyde Garman, metallurgical engineer; H. C. DeVries, chemist; R. H. Beggs, geologist; and Henry Mathes, maintenance superintendent.

**Turn Page for Flowsheet of Natividad Plant ➡**

# FLOWSHEET
# Kaiser Aluminum & Chemical Corp. Natividad Plant

### PRIMARY CRUSHING PLANT

Trucks arriving from the mine at set intervals dump their load into a large hopper-shaped concrete bin equipped with a Sheridan grizzly. The plus 5 in. oversize from the grizzly is reduced in a 36 x 48 in. Traylor jaw crusher. A 30-in. incline belt conveyor carries the crushed product and the undersize from the grizzly to a screen.

### SCREEN

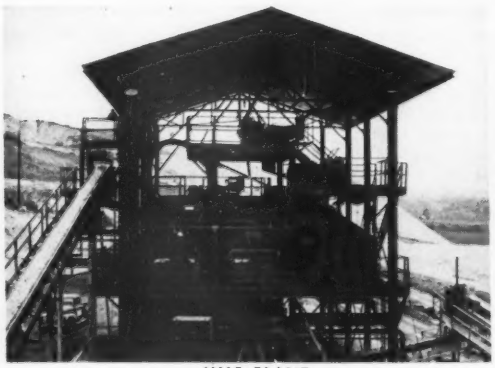
The 5 x 12-ft. double-deck Tyrock vibrating screen has 2½-in. openings in the upper deck; ½-in. in the lower. A 30-in. belt conveyor carries oversize from both decks to stockpile. The minus ½ in. is decomposed granite and siliceous material.

−½ in. → WASTE

+½ in. →

### STOCKPILE

Plus 4-in. material is withdrawn from stockpile by H-B apron feeder in concrete tunnel under the stockpile.



### HMS PLANT

The prefabricated Wemco HMS unit handles 250 tph. of plus ¼-in. feed. Here is a chemical analysis of the feed.

| Chemical Composition | Limits | Av. Analysis |
|---|---|---|
| Free $H_2O$ | Tr. | Tr. |
| L.O.I. | 45.00 to 47.00% | 46.90% |
| $SiO_2$ | 0.43 to 2.12 | 1.31 |
| $R_2O_3$ | 0.30 to 0.70 | 0.55 |
| CaO | 30.60 to 32.00 | 31.75 |
| MgO (by Diff.) | 19.00 to 21.00 | 20.30 |
| | | 100.00 |
| CARBONATE EQUIVALENTS | | |
| CaO as $CaCO_3$ | 53.54 to 57.11% | 56.69% |
| MgO as $MgCO_3$ | 39.73 to 43.93 | 42.46 |

### CONE

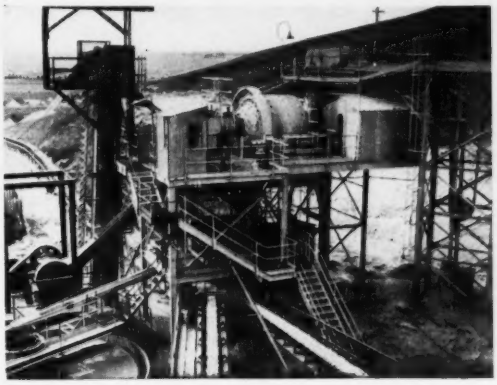
Ferrosilicon is used as medium in the 18-ft. diameter Wemco cone separator. An effort is made to maintain a gravity of from 2.65 to 2.75. Losses of medium during the first 3 months' operation were less than one pound per ton of sink material recovered. This table gives composite samples with analysis for operation in April.

| | L.O.I. | $SiO_2$ | $R_2O_3$ | CaO | MgO |
|---|---|---|---|---|---|
| Sink | 47.2% | 0.32% | 0.36% | 31.3% | 20.8% |
| Float | 38.1 | 14.24 | 1.70 | 35.5 | 20.5 |

HMS flowsheet follows standard design. Principle equipment units are: 4 Allis-Chalmers low head vibrating wash screens; magnetic separator; medium densifier; de-magnetizing coil; motor generator set; air compressor; medium return, and cleaned medium pumps; washing hopper and sump; and central control panel.

FLOAT → WASTE

SINK →



## PREPARATION PLANT

Preparation of rock for the HMS plant includes scrubbing, crushing, washing, and sizing. Feed from the stockpile goes to a 10-ft. by 66-in. Hardinge scrubber with a trommel containing 4½-in. round holes at the discharge end. This is driven by a 250-hp. motor and runs at 15 rpm.

+4¼ in.

### JAW CRUSHER

Trommel oversize is crushed in a 15 x 38-in. Telsmith jaw crusher, and is returned to the scrubber via bucket elevator.

−4¼ in.

### SCREEN

Undersize (−4½ in.) is washed and sized on a Tyrock double-deck vibrating screen. Upper deck has ¾-in. screen; the lower has ½-in. screen. Oversize from both decks is belt-conveyed to HMS plant

−¼ in. +¼ in.

### CLASSIFIER

Undersize from the screen is conveyed to waste dump after dewatering in a large Dorr bowl classifier.

WASTE

### SCREEN

Feed from sink stockpile is screened by 4 x 10-ft. Tyrock double-deck vibrating screen with 2-in. screen in top deck, ¾-in. in bottom.

−¾ in. +¾ in.

### CRUSHER

A 4-ft. Symons cone crusher reduces oversize from primary screen,

### SCREEN

Secondary screen has ¾-in. rectangular openings on top deck; ¾-in. square openings on bottom. Top deck over size returns to crusher. Over- and undersize from bottom deck are treated on separate screens as special products.

Undersize Oversize

SPECIAL PRODUCTS

### KILN FEED BINS

(Some product from secondary crushing plant is stockpiled.)

### SCREEN

A 5 x 12-ft. double-deck Tyrock vibrating screen with ⅜-in. screen on the top deck and ¼-in. on the bottom, produces three products.

+⅜ in. −⅜ in., +¼ in. −¼ in.

## KILNS

Two 8 x 299-ft., and one 9½ x 280-ft. gas-fired, counter-current, Smidth Unax rotary kilns produce three products from the different size feeds.

| Size | Temperature | Product |
|---|---|---|
| +⅜ | 1300 – 1400°C. | Regular calcine for Kaiser magnesia products plant at Moss Landing and near-by lime plant. |
| −⅜, +¼ | 1400 – 1500°C. | Hard calcine for Kaiser magnesium plant at Manteca. |
| −¼ | 1700 – 1800°C. | Dead burned calcine for steel industry. |

Regular calcine for near-by lime products plant is treated in a Raymond mill for reduction to 95% minus 100 mesh, or it may go to a hydrator, soaking pit and Raymond mill to produce hydrated magnesium lime.

# KEEPING TAB ON PRACTICE

THIS DRILL CORE was taken with Madson-Brown core barrel from churn-drill hole in pit near Hibbing. Small pieces of rock can be seen in the ore.

## New Core Barrel and Driving Equipment Permit Accurate Sampling of Soft Ores

BY ADDITION of a core barrel and a driving device of new design, standard churn-drilling equipment can be used to take accurate core samples in soft and moderately hard ores. A reduction in sampling cost is also claimed. This equipment has been developed by Leo Madson and Paul Brown, of Hibbing, Minn., on the Mesabi Range. Mr. Madson's Hibbing address is 2019 Third Ave., East. His description follows:

Most of the exploratory drilling in Minnesota iron ore has been done with diamond drills primarily because a core could be taken in hard ore and rock and because the diamond drill could penetrate any material. Diamond drilling furnished a sample for structural analysis and for chemical analysis. It is costly, however, and in soft ores not too satisfactory.

Sampling of soft ores is being done in several ways, but results have not been too reliable.

The methods that have customarily been employed to secure a representative sample of an orebody are:

**1. Use of wash rods and chopping bits** to grind up the ore, as in standard exploration methods. Water is pumped down through the rods and bit, forcing the cuttings up through the cased hole and outside of the wash rods. Cuttings are run into a container to permit the ore to settle out. This is removed and sent to the laboratory.

**2. Structure drilling.** This is almost the same as the preceding method, except that the circulation of the water is reversed. The water is pumped down the hole between casing and rods and returns up through the rods, bringing with it the ore cuttings. In structural drilling, larger diameter tools are usually used, which produce larger-sized cuttings.

**3. Churn drilling.** In this method, casing is generally used. However, it is not uncommon to drill without its use because this is faster and more economical. The ground is drilled to the desired depth (say 5 ft.), using water to make a muddy ore, which is thoroughly agitated and bailed out. Part of the ore sludge is kept and used as a sample of the ground penetrated.

### Some Difficulties

Water is necessary in each of the three methods. Its use is detrimental to taking good samples, as it permits a crude concentration which tends to make the sample less representative. Use of water also makes it impossible to get a moisture determination, so that the laboratory must estimate the percentage of variation between sample and orebody. Cable and rod tend to slap along the upper portion of the drill hole, loosening particles of ore and rock which contaminate the sample being taken.

Even though casing is used, it is sometimes difficult and costly to keep it on the bottom of the hole at all times. Water in the ground can keep washing in under it, bringing impurities to contaminate the sample. Also a thin layer of hard ore or rock will usually keep the casing from following behind the bit. In such a case, the casing must be raised a safe distance and the hard section blasted. The hole must then be cleaned out and the casing driven on through this enlarged hole. This may require several charges.

Because of the disadvantages inherent in the three methods, a better method is needed. The one described requires no water and lets no impurities get into the sample. The sample should represent the ground drilled. With the method, a 5-ft. length of 2½-in. core can be withdrawn from the hole. This sample is big enough for the laboratory without costing too much to take. Use of the method is not confined to this diameter and length of core. The core is removed in a simple way that permits visual examination. Aside from securing a sizeable, representative sample, a cost reduction is realized.

### New Method Reliable

In the new method a standard churn drill and drilling tools are used, save that in place of the drill bit a driving device is attached. This comprises a driving member, taper-threaded at its upper end to engage the bottom end of a drill stem. The lower end is axially bored and threaded onto the upper end of a piston rod.

The length of this piston rod either equals or exceeds that of the regular drill stroke. Threaded on the lower end of the rod is a piston in the form of a solid-steel cylinder having longitudinal grooves in its surface and sliding in a tube. The grooves let air and water by-pass inside the cylinder. Threaded into the upper end of the tube is a bushing which guides the piston rod. Threaded into the tube's lower end is a heavy solid plug which makes a fluid-tight seal. The plug is threaded internally at its lower end to receive the core barrel.

Immediately above the solid plug two holes have been drilled and threaded and flush plugs inserted. The latter are left in whenever the coring is being done in a dry hole and are removed whenever water is met. They can be removed while working under water to force out any water that leaks into the cylinder.

### A Five-Part Core Barrel

The core barrel has five parts:

1. Outer barrel, tapered in downward direction both internally and externally.

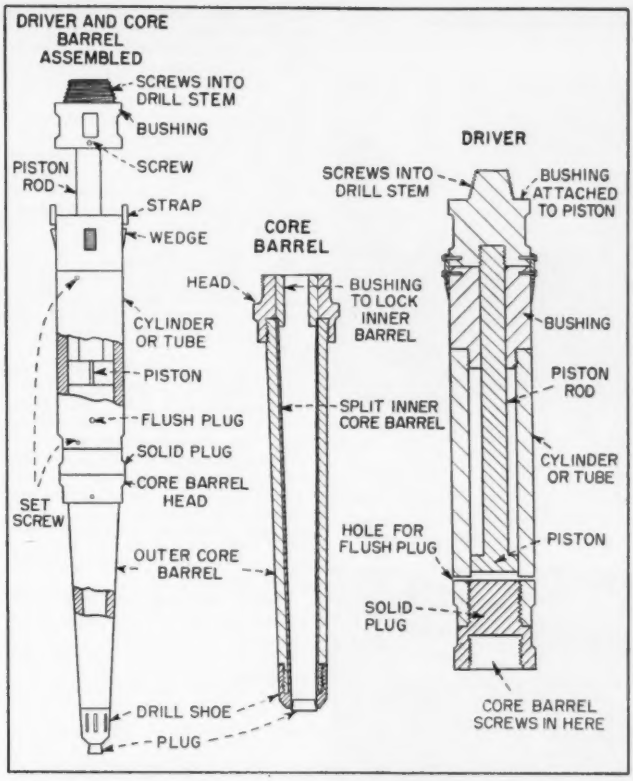
2. Inner barrel, tapered internally and externally and split longitudinally.

3. Renewable drill shoe, also tapered. This protects the outer core barrel and locks the inner barrel in place. It is grooved for attaching a spanner wrench.

4. Bushing which fits within outer barrel and is used to lock inner barrel and keep it from moving upward.

5. Tapered rubber plug which fits into the open end of drill shoe. This prevents water or sludge from entering core barrel as it is lowered into the hole, also any contamination of sample from outside source. It also permits a moisture test to be run of resulting core.

The barrel is driven into the ground by utilizing the spudding action of the churn drill to operate the driving device. The driver is so designed that




**CORE BARREL and driver devised by Leo Madson and Paul Brown, of Hibbing, Minn., for sampling soft ores.**

the piston cylinder is long enough to prevent the piston from striking the cylinder top upon the return stroke of the spudding action of the drill or the return stroke of the piston itself. This prevents the barrel from being dislodged or pulled up during the return stroke before the desired depth is reached. When this is reached, the barrel is readily retrieved by winding up the cable so that the drill stroke will hit the top of the driver instead of allowing the driver to hit on the driving base.

After the core barrel has been filled and withdrawn, the drill shoe is removed. As the outside wall of the inner barrel or liners is tapered to conform to the inside taper of the outer barrel, it is necessary only to use a short drive pin held firmly against the smaller-diameter ends of the liners and strike two or three blows with a hammer to start the liners moving. After this they can be removed by hand. The two sections making up the liners are then parted, exposing the unaltered sample.

After the sample has been taken out, the regular drilling tools are used to drill out the section previously sampled. This must be done to enlarge the hole enough so that the coring tools can take this next sample. The process is repeated as often as may be necessary in order to take samples to the desired depth.

Advantages claimed are:

1. Standard drilling equipment of the churn-drill type in use today is employed.

2. Accurate samples can be taken in soft or moderately hard materials.

3. Sampling of mineral deposits is done in advance of the bottom of the hole, avoiding contamination.

4. Samples are recovered as a core for visual examination, showing the material exactly as it occurs in place.

5. Sampling is done without using ground water in the drill hole or water introduced into the hole, thereby recovering a sample for complete chemical assay and of analysis representing exactly the constituents of the material penetrated, including the natural moisture. Such sampling has heretofore been impossible by any standard drilling method.

The method provides a long needed system of reliable sampling at minimum cost.

## How Long Can Long Holes Be?

IN VIEW OF continued experimentation with long-hole drilling using coupled rods and carbide bits, the question may be raised as to whether the optimum economic length for given conditions has not increased. In our February summary, citing data previously obtained, *E&MJ* gave 60 ft. as a temporarily accepted figure. An eastern equipment manufacturer claims it should be much higher. Opinion of operators with experience in long-hole work is solicited, with any supporting data. Comment that is received this way will be published in these pages.

Much work with long-hole drilling has been done by Howe Sound's Chelan Division at Holden, Wash. In their mining system, length of hole is of course dependent upon width of ore and height of lift being mined. John J. Curzon, manager, says that past experience has shown that 70-ft. holes are easily drilled and blasted and that it is best to hold to this length as maximum in most ring patterns. The 70-ft. maximum has become standard there. Generally, when longer holes are required, up-holes are drilled from below to reduce the length of holes required in the ring. Recently holes have been drilled to a maximum of 86 ft. without apparent difficulty or undue loss of efficiency. Longer holes in general may be more difficult to load and may cause bootlegging, especially if they have wandered from the line.

The manufacturer's statement that certain drill rods and carbide bits are giving success up to 150 ft. may not be out of line, Mr. Curzon thinks. The deciding factor would be the type of ground. At Holden, 150 ft. would be unlikely. In softer rock, he thinks Holden's equipment could drill far beyond the distance now considered maximum. The purpose in drilling a hole as long as 150 ft. would of course have to be considered.

At Holden, the following equipment has become standard for long-hole work:

4-in. drifters.

1¼-in. round carbon steel, lugged for adapters.

1¼-in. round carbon steel with Type 2 threads for drill rods.

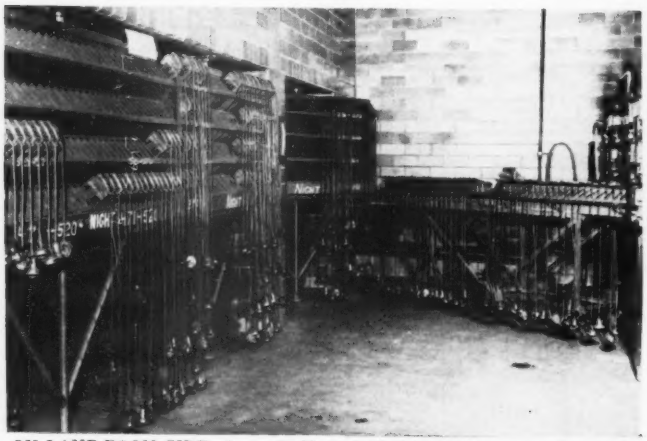
1¾-in. mild steel tubing for case-hardened couplings.

This combination of drilling equipment gave the following performance in 1951:

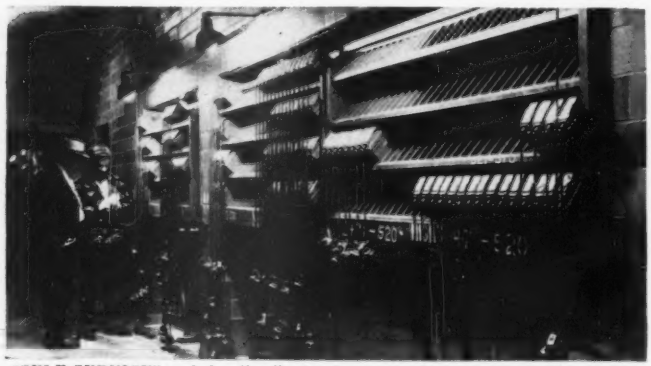
Footage per drill rod, 351.
Footage per adapter, 198.
Footage per coupling, 108.

*Please turn to p. 102*

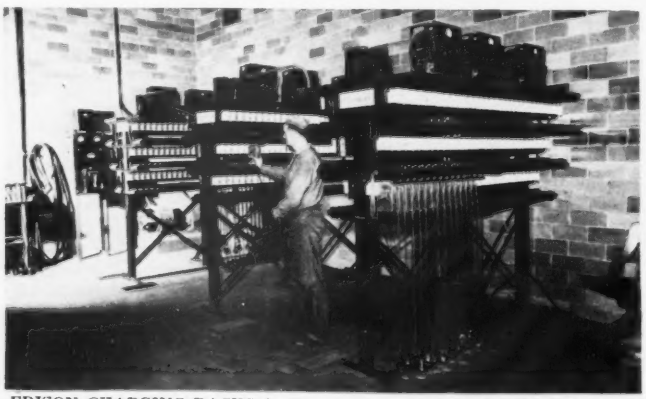
## Streamlined System for Handling Cap Lamps Is Faster, More Efficient



ON LAMP-ROOM SIDE of new "self-service" distribution system. Lamps for each shift are kept separate. At right is special dolly for carrying lamps.



"SELF-SERVICE" rack for distributing lamps revolves between the lamp room and the corridor through which miners pass to and from the shaft.



EDISON CHARGING RACKS for R-4 lamps are shown. Attendant has positive control over charging and maintenance.

DESIGN AND OPERATING PROCEDURES for a new lamp house at Mather "B" shaft of Negaunee Mine Co., Negaunee, Mich., include the basic elements for efficient maintenance and distribution of cap lamps. The mine staff planned the system. It provides: (1) speedy and easy distribution and return of lamps; (2) positive control of distribution, charging and maintenance; (3) maximum utilization of available space, and (4) functional efficiency and responsibility of lamp house personnel.

An outstanding feature is the use of reversible "self-service" racks for daily distribution of the new Edison R-4 lamps, supplied by MSA. At "B" shaft, there are 544 of these lamps in service.

The racks are built on center pivots in one wall of a corridor between changehouse and shaft. The lamp room is on the opposite side of the wall. This enables attendants to insert charged lamps in slots on one side and then swing the entire panel around to face the corridor where miners can remove their individual lamps quickly and easily. There are three reversible racks, each marked as to shift and clock number groups. Total rack capacity is 696 R-4 lamps.

With this type of distribution, there is no chance of an unrecharged lamp getting back into service.

When the racks are swung around to face the lamp room, the attendant merely removes the lamps from that shift and loads them on a specially designed dolly which then is wheeled to the Edison R-4 charging racks. Each lamp is carefully inspected before it is placed in the charging rack.

## Tunneling Record 111 Ft./24 Hours

**A New World Record for Tunneling** was hung up on April 10 last, when an advance of 111 ft. was made in sandstone in 24 hours in a water-supply tunnel 9 ft. 4 in. wide in the rock and roughly horseshoe-shaped in cross section. The project was Tunnel No. 4, North Poudre Supply Canal, in Colorado. The contractor was the G. L. Tarlton Contracting Co. The round of 36 holes was drilled with four jumbo-mounted machines, using Timken carbide bits and 10-ft. rods. Mucking was done with Model 21 Eimco loaders and 90-ft. Granby-type cars.

## Where Off-Highway Trucking Stands

**Heavy-Duty Trucks** on the Mesabi Range now number 1,328, according to a recent estimate, or will do so as soon as certain units now on order are delivered. Of these 165 are made by Mack, 70 by Dart and the rest largely by Euclid. Truck transport of iron ore on the Range began in 1937. Today more than half of the iron ore mined in Minnesota is moved out of the pit by this means.

# Aid or Trade?
# A CRISIS AHEAD

A crisis in the foreign trade relations of the United States is in the offing. It is a crisis caused by:

1. Efforts of producers in friendly nations to earn more dollars by increasing exports to the United States, and
2. Efforts of industries in the United States which would be hurt by competition from these imports to keep them out.

*This crisis is a threat to the effectiveness of American leadership in the crucial effort to build the nations of the free world into a strong and unified group.* It is the purpose of this editorial to advocate a constructive approach to the difficult situation that is developing.

## Background of the Crisis

Most countries in the free world—with American aid—have managed to push their outputs well above prewar levels. As they have done so, they have been urged by our highest government officials to increase their exports to us. Sales in our market enable these countries to earn dollars which they use in turn to buy the products of America's farms and factories. Thus, as they become self-supporting, the need of American aid is reduced.

But as these efforts to export more to the United States have promised increasing success, competitive American producers have become increasingly alarmed about what that success might do to them. Consequently, they are seeking more protection—by appeals to the U. S. Tariff Commission to recommend higher import duties and by appeals to Congress for new laws to discourage imports.

## Our Friends Protest

A year ago Congress answered one of these appeals by imposing a quota on imports of dairy products. Now, among many other legislative proposals being strenuously pressed is a move to extend the scope of "Buy American" legislation. A year ago the U. S. Tariff Commission had only four petitions for increased import duties on its docket. Since then fourteen more petitions have been filed and others are definitely on the way.

*Faced by these mounting efforts to block the sale of their products in the American market, no less than eleven friendly nations, including Great Britain, France, Italy, Canada, the Netherlands, Switzerland and Denmark, have filed protests with our State Department.* Through many of the protests runs one refrain. Although stated in diplomatic language, it might be correctly paraphrased to say: *"In*

*sending us aid you have made it very clear that you want us to get on a self-supporting basis at the earliest possible moment. But, when we begin to make headway in that direction by trying to sell you more of the things we are equipped to produce, you start closing your market to us."* The threat of European resentment against the United States being stirred up by this argument is obviously great.

At the same time there exist grounds for special resentment in the United States against certain prospective imports of European manufactured goods—those of machine tools, for example. In part these will be produced with machinery that has been sent to Europe as part of our economic aid program. With absolutely no diplomatic language involved, the argument, which will be extended much farther than the facts would justify, will run: *"We gave those people the equipment that they now use to cut our throats!"* This line of argument will find response among workers as well as employers in industries faced by more competition from imports. Labor, too, is keen for protection against more foreign competition.

### Aid or Trade?

As between continuing direct economic aid to Europe or accepting the imports that would make those countries self-supporting, some would prefer to continue the aid program. They argue that the tax machinery of the federal government can spread the burden of aid broadly, while we have no comparable machinery that can cushion the shock to individual industries, firms and communities that may result from stepped-up imports of competitive products.

As we see it, this position is untenable. It would make rubbish of our Atlantic Charter promise ". . . to further the enjoyment by all States, great or small, victor or vanquished, of access, on equal terms, to the trade and to the raw materials of the world which are needed for their economic prosperity." It would be an admission that, for all our profession of faith in competition and our opposition to European cartels, we really don't believe in competition.

### U. S. Self-Interest

*The people of this country have invested billions of dollars and seven years of hard work in the attempt to put our allies on a self-supporting basis. If we keep their goods out by raising trade barriers, we are directly defeating our own purposes.*

Also, in moving to protect some groups of American producers we should be hurting others. For many American producers the export market, which this year will take about $14 billion of civilian goods, spells the difference between operating at capacity and closing down 25% of their facilities. When we discourage imports we cut off dollar earnings by other nations which are spent here to keep some of our factories and farms going.

*At the same time, it must be recognized that certain American industries and their capacity to maintain employment will be hurt by increased imports. Hence it becomes critically important for the United States to formulate a national program designed to help these industries and communities take up the shock.*

There is no neat and simple prescription by which this can be done, but several possibilities have been suggested. One on which there is general agreement is that tariff reductions should be gradual. To cushion their impact, the government might well give preference on defense orders to industries and areas adversely affected by an increased volume of imports. Direct assistance to workers and companies in shifting to different lines of business may be worth consideration.

These are by no means all the possibilities. They may not even be the best. But they do serve to suggest the necessity for flexibility and imagination in dealing with the growing crisis in trade relations. *Our ingenuity in developing new ideas to meet this crisis may well be a decisive factor in our effort to weld the free nations into a strong and durable alliance.*

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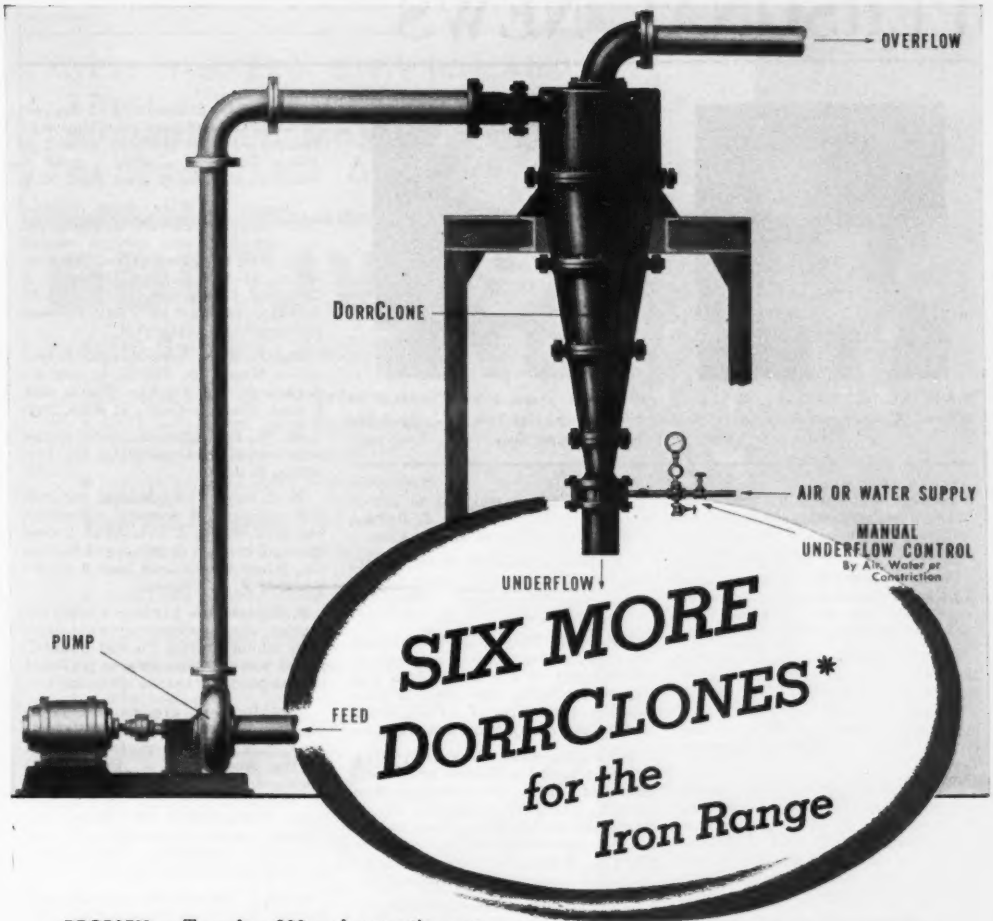


**PROBLEM** — *To make a 200 mesh separation on a high-solids content iron ore . . . without prior dilution.*

**RESULT** — *Extensive test work on a 24" dia. DorrClone resulting in an order for six additional 24" units.*

At Cleveland Cliffs Iron Company's Canisteo Washer, a 24" dia. DorrClone was installed on a test basis to determine the desirability of desliming their classifier overflow prior to conventional fine ore treatment. Standard hydroseparation was impossible without considerable dilution as these overflows contained a high percentage of solids.

The DorrClone was required to make a satisfactory size separation on feeds varying widely in both percent solids and structure. During the tests, solids varied from 17-35% and +200 mesh in feed varied from 25-35%. The Beneficiation Engineer at Canisteo reported that "after initial adjustments, these variations seemed to have little effect on the operation . . . the DorrClone operated very satisfactorily."

If you have a desliming problem, there's a good chance that the DorrClone, with its high capacity-for-size and ability to handle flocculant or heavy pulps, will be the solution. For further information write for bulletin No. 2500. The Dorr Company, Stamford, Conn.

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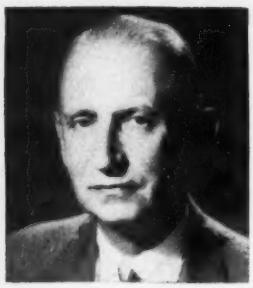
# PERSONAL NEWS



FRANK B. McKOWN (left) has been appointed vice president and CHARLES N. WHITAKER, assistant sales manager of Kennecott Sales Corp., New York, N. Y., the United States sales agency for Kennecott Copper Corp.

**Eugene M. Dale, Jr.**, has been named plant superintendent at Potash Company of America's Dumas, Tex., plant. **J. J. Morrison** is plant foreman.

**Gerald G. Hatch** has been appointed director of research and development for Quebec Iron and Titanium Corp. with headquarters at the Sorel Works.

**Leon W. Dupuy**, mining engineer, is the new coordinator of mineral resources studies for the U. S. Bureau of Mines, Washington, D. C. Mr. Dupuy was formerly special assistant, Region VI of the Bureau, Amarillo, Tex.

**Plato Malozemoff** has been elected a vice president of Newmont Mining Co., New York, N. Y. Mr. Malozemoff joined Newmont in October, 1945, coming to the company from the Metals and Minerals Branch of the OPA, where he served during the war years.

**L. A. Barron**, engineer with Vermiculite Institute, Chicago, Ill., has been named manager of the Institute's new technical service department, formed to do liaison work between the vermiculite industry and allied fields; also, governmental bodies. **James Spence** succeeds Mr. Barron.

**George W. Spencer**, vice president, announces that Leonard J. Buck, Inc., Jersey City, N. J., has been appointed exclusive export agent for all foreign countries, excepting Canada, for Electro Manganese Corp., Knoxville, Tenn.

**Ralph Hennbach**, assistant superintendent of the zinc department, El Paso, Tex. plant of Asarco, will spend the next year as a fellow of the Sloan Foundation at Massachusetts Institute of Technology.

**John G. Leckie**, formerly general superintendent of the Baltimore, Md. plant, Asarco, has been promoted to manager.

**Wayne Bolitho**, mining engineer formerly at Star Lake, N. Y., with Jones & Laughlin, has resigned to act as assistant to his father, **E. C. Bolitho**, in fee inspection work at Ely, Minn.

**Charles C. Goddard**, Butte, Mont., has joined Kennecott Copper Corp.'s northwest exploration office as mining geologist.

**Thomas P. Thayer**, U. S. Geological Survey, in recognition of his work on the geology of the Bomi Hills iron deposits, Liberia, was made a commander of the Star of Africa. Order was conferred by President Tubman.

**Peter Joralemon**, Park City, Utah, has been named a director and superintendent of mines for New Park Mining Co., Utah. As a director, he replaces the late **Fred E. Wise**, and as mining superintendent he succeeds **Clark L. Wilson**, now first vice president and manager of operations.

**R. A. Pallanch**, smelter and then mill superintendent at Midvale, Utah, has been named consultant on milling and metallurgy for United States Smelting, Refining and Mining Co. **C. A. Nelson**, superintendent of the Midvale smelter since 1939, is now general superintendent of the Midvale plant, including milling and smelting. Assistant Smelter Superintendent **Archie A. Nelson** has been promoted to mill superintendent; **F. J. Marshall**, veteran with 19 years' experience, assistant smelter superintendent; and **Allan C. Vaugh**, assistant director of the USSR&M research laboratory at Midvale.

**James T. Finlen**, member of the legal staff of Anaconda Copper Mining Co. since 1928, has been named western general counsel, succeeding **Roy H. Glover**, now vice president and general counsel. **Sam Stephenson, Jr.**, a member of the legal staff since 1945, will head a new division to be known as the western labor relations department. **Joseph B. Woodlief**, secretary of the Silver Bow Employers Association, assistant to Mr. Stephenson.

**W. A. Vine** is returning to his post of associate professor of mining engineering at the Missouri School of Mines, Rolla, Mo., after a year at Columbia University, New York, N. Y.

**Thomas M. Ware**, chief engineer since 1949, and **Edward D. McDougal, Jr.**, secretary and general counsel since 1947, have been elected vice presidents of International Minerals & Chemical Corp., Chicago, Ill. **C. M. Edwards**, assistant secretary, has been advanced to secretary.

**Don E. Hyde**, formerly with Bristol Silver Mines Co., Pioche, is now superintendent of Rip Van Winkle unit, United Minerals Corp., at Elko, Nev.

**M. W. Batchelor** has been named president of Riverside Metal Co., Riverside, N. J.

**W. C. Page**, vice president and general manager of western operations, has been elected a director of United States Smelting Refining and Mining Co., filling the vacancy caused by the death of **F. F. Colcord.**

**R. S. Stevenson** has been elected executive vice president of Allis-Chalmers Manufacturing Co. and **Willis G. Scholl** succeeds him as vice president in charge of the tractor division.

**Ford Bartlett**, president of Lockwood, Kessler & Bartlett, Inc., Great Neck, N. Y., has been elected chairman of the Association of Professional Photogrammetrists, succeeding **Virgil Kauffman**, president, Aero Service Corp., Philadelphia, Pa. **Fowler W. Barker**, secretary-treasurer of Air Transport Association, Washington, D. C., was re-elected secretary.

**Frank L. Magee**, vice president and general production manager of Aluminum Company of America, Philadelphia, Pa., has been elected a director. **Alfred M. Hunt**, a member of the board, was elected to succeed **J. R. D. Huston** as secretary. Mr. Huston is retiring after eight years in the post.

**Donald T. McMillan**, previously with Anaconda Copper Mining Co. at Butte, Mont., is now geologist with Fresnillo Co., Fresnillo, Mex.

**G. A. Collins**, president, Collins-Western Corp., has recently returned to his Santa Barbara, Calif. offices from Hazelton, B. C. where he was making a scintillometer survey on Rocher Deboule Mountain.

**William C. Hayes, Jr.** has accepted a position as geologic engineer with Cecil M. Hawk & Assoc., Lubbock, Tex.

**Attilio V. Berdusco** has joined Algoma Ore Properties, Ltd., Wawa, Ont.

Freeport Sulphur Co. has elected four new vice presidents: **Z. W. Bartlett**, assistant general manager of

**NEW 4-SPEED SWIVELHEAD BRINGS STILL GREATER EFFICIENCY TO WORLD'S MOST POPULAR UNDERGROUND DIAMOND DRILL**

# BBU "JV"

## *with* 1-JEG *swivelhead*

incorporating these outstanding features:

- newly designed shift mechanism that permits instant shifting to any one of four feeds regardless of bit pressure or speed.
- large exceptionally strong trouble-free feed shifter key.
- short massive countershaft.
- long rigid drive sleeve with built-in tool steel drive sleeve keys.
- drive sleeve bearings spaced exceptionally far apart to give feedscrew maximum stability.
- long full acme threaded feed nut.
- both drive sleeve and feed nut carried on extra large duty, adjustable timken taper roller bearings.
- extra large heavy duty feed screw.
- compact, fully enclosed, easily accessible, unit construction.
- all bearings and moving parts automatically lubricated through alemite fittings.
- head readily interchanged with those used on model BBS-1.

*Proved* on both core and blasthole work

AT BRITANNIA, B.C.—
where an extensive core drilling program is being undertaken for the Britannia Mining & Smelting Company.

AT KEMANO, B.C.—
where a huge power house for the Aluminium Company of Canada is being constructed inside a mountain.

WE LOOK INTO THE EARTH

**BOYLES BROS**
DRILLING COMPANY LTD.,
VANCOUVER, CANADA

# E&MJ Salute for Outstanding Service

FRANK AYER

IF FRANK AYER is in the audience at, for example, a meeting of the local section of the AIME, you will know it. He will get up after the speaker has finished his talk, and he will ask questions that are intelligent, forceful, and sometimes, for the speaker, uncomfortably direct.

Frank does this, however, with a manner so pleasant and disarming that the speaker usually finds himself answering even the uncomfortable questions.

Few men have done more for the copper mining industry of the world than Frank Ayer. He has a record of service of which he could be proud. Yet pride isn't in him. We, and everyone else who knows him, like Frank because of his unfailing cheerfulness and modesty and his willingness to listen to your own problem no matter how great his own burden of the moment might be.

For seven years past, Frank Ayer and White Pine have been synonomous. In 1945 he tackled the job (which many experienced men thought hopeless) of developing mining, metallurgical, and financial methods by which the 300-million-ton White Pine orebody of Copper Range Co. could be brought into production.

He saw the metallurgical work through one long test program after another, and at last a concentrate re-grinding technique was worked out that brought grinding costs, a major road-block, down to reasonable size.

He saw the exploration and mine planning phases up through a hundred stages of study, revision, recheck, and re-examine. He saw all the plans through the tortuous channels of the RFC, until at last a loan of $57-million was concluded between RFC and Copper Range Co., and a DMPA copper purchase contract was signed.

Now, after seven years of the hardest unremitting kind of toil, Frank has done everything he set out to do. The White Pine orebody is on the way to production, and Frank is on the way to a brief and well-earned rest. He resigned as vice president of Copper Range last month, but he will continue to maintain his office at 40 W. 40th St., New York, N. Y.

Frank Ayer is a Columbia man, class of 1911. His record reads like a history of copper mining. His first job was as assistant geologist with Detroit Copper Co. in Morenci, Ariz., but he also worked at Inspiration and at Phelps-Dodge's Tyrone mine before World War I came along. Frank volunteered, went to France, and wound up captain commanding the 270th Aero Squadron, U. S. Air Service.

After the war he served as assistant, and later, mine superintendent at the Moctêzuma mine of Phelps Dodge at Nacozari. By 1924 he had become manager of all operations there.

In 1927 Frank was transferred to the managership of Phelps-Dodge's largest properties at Morenci, Clifton, and Metcalf. Not only were costs cut to the lowest point in the company's history while Frank was manager, but the production of fire-refined copper was worked out. Frank also directed exploration of the 325-million-ton Clay orebody, and recommended the methods of mining and metallurgy that are in use there today. His recommendations were based on long studies of open pit vs. block caving, leaching and electrolysis vs. flotation and smelting.

In 1933 Frank switched to Africa, where he became general manager of Roan Antelope Copper Mines, Ltd. and also representative in Northern Rhodesia of Mufulira Copper Mines, Ltd. From 1936 on, he managed both properties.

During World War II, Frank served as chief of primary copper production with the War Production Board. Both the industry and the nation were lucky to have had his help at a particularly difficult time. He worked with the WPB until 1945, when he was released to begin his work with White Pine.

Consider a moment the tonnage of ore and copper Frank has handled over the years. Omitting properties he merely supervised, Frank Ayer has been in charge of development and planning of three major orebodies: Morenci, Mufulira, and White Pine. Together they total about 800-million tons of ore, and an annual production of about 735-million lb. of copper.

That's Frank's contribution. That and the real friendship and help he's given to so many in the industry, old or young, high or low. We're proud to know him and we wish him luck in whatever he chooses to do from now on.

Freeport's southern operations with offices in New Orleans, La.; **J. C. Carrington,** formerly assistant to the president in New York, N. Y.; **H. C. Petersen,** head of the company's oil and gas division, Houston, Tex; and **K. T. Price,** manager of the Louisiana division, Port Sulphur, La.

**Charles P. Loucks** has been made production manager of the Eastern Clay Products Department of International Minerals and Chemical Corp.'s industrial minerals division, and **John D. McKenzie** has been made assistant to the vice president of the division.

**Walter O'Toole,** mining engineer, formerly with the U. S. Atomic Energy Commission at the Denver Exploration Branch, Colo., has joined the Utah Construction Co. at Cedar City.

**A. W. Lankenau** has left Denver Equipment Co., Colo., to join National Lead Co. at Fredericktown, Mo.

**Richard R. Hyde** has left Andes Copper Mining Co., Chanaral, Chile, to join El Paso Natural Gas Co., El Paso, Tex.

**R. A. Beals,** formerly with Jones & Laughlin Steel Corp.'s ore research division at Negaunee, Mich., has come to New York as assistant editor of the AIME's *Mining Engineering.*

**A. P. Mason** is now employed by the National Gypsum Co. at Clarence Center, N. Y., as an engineer-in-training.

**C. P. Keegel,** since 1950 responsible for the management of Cia Minera Agua Fria, S/A Honduras, is now located at 707 South Sixth St., Las Vegas, Nev., as a consulting metallurgical and mining engineer.

**J. C. Van De Water** has left Miami Copper Co., Ariz., to join the Ray division of Kennecott Copper Corp., Ariz., in the same capacity of superintendent of mines.

**A. W. Tolonen,** formerly with Potash Company of America, Carlsbad, N. M., has joined Anaconda Copper Mining Co., Butte, Mont., as a draftsman.

**Annan Cook,** with Kennecott Copper Corp.'s exploration department, New York, N. Y., has been appointed district geologist for the east. **Lowell B. Moon,** former chief, Minerals Division of the Bureau of Mines, has been appointed district geologist for the

# YOU GET MORE FOR YOUR MONEY WITH Firestone TIRES

## *Because there is more built into them!*

FIRESTONE off-the-highway tires give you more for your money because they are engineered and built with the extra advantages that reduce downtime to a minimum.

New TENSION DRIED, SUPER GUM-DIPPED cord construction gives extra long body life, because you get more retread service and fewer downtime losses. There's no tire growth. Clearance and mating problems are simplified. There's no tread cracking. Cuts don't "grow." There's a 60% stronger bond between cords and body rubber to give you the strongest body ever built.

Firestone off-the-highway treads last longer because they're built double thick with *extra* tough, cut-resisting tread stock. Four *extra* tread plies absorb shocks and give maximum protection against impact breaks. The sidewalls are *extra* thick and snag-resistant.

AMERICA'S FUTURE PROGRESS DEPENDS ON BETTER AND SAFER HIGHWAYS

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northwest. **Donald D. Smythe** is district geologist for the southwest; and **C. H. Burgess** will handle the central states.

**Frank E. Downing**, St. Paul, Minn., has retired after 13 years as chief engineer of the mining division, Minnesota Department of Taxation.

**George H. Tousley, Jr.**, previously with Cia Minera de Oruro, Bolivia, is now with Cia Minera Unificada del Cerro de Potosi, Bolivia, the Mauricio Hochschild enterprise.

**Henry Ford**, mining engineer with the Verona Mining Co., is now assistant mining captain at the Buck mine of Pickands Mather & Co., Iron River, Mich.

**V. A. Brussolo**, vice president and chief engineer for Soriano & Co., Philippines, was recently in New York.

**Howard I. Young**, president, American Mining Congress, has been awarded an honorary degree of Doctor of Laws at Lindenwood College, St. Charles, Mo.

**H. B. Chessher**, Reno, Nev., has been elected president and general manager of Siskon Corp. (formerly Goldfield Great Bend, Ltd.), Siskiyou County, Calif.

**D. E. Green**, of Bear Canyon Mining Co., was named president of Arizona Asbestos Producers Association. Other officers named were **Barry DeRose**, Apache Asbestos Mines, vice president; and **Jack Neal**, Metate Asbestos Co., secretary-treasurer.

**W. D. Johnston, Jr.**, chief, Foreign Geology Branch, U. S. Geological Survey, was made an officer in the Order of the Southern Cross in recognition of his geological work in Brazil.

**Neil Munro** has assumed the responsibilities of managing director of Dorr Oliver Ltd., Bombay, India. Mr. Munro succeeds **P. M. Contant**, who will now be located at the company's Stamford, Conn. offices.

**Harry Judson**, formerly of the Central Industrial Division of North American Sales, has been transferred to International Sales and has relieved **Neil Munro** as technical representative in Johannesburg, South Africa, located with E. L. Bateman, Ltd., representatives of Dorr.

**Frank M. Estes**, of New York, N. Y., has left for Colombia, S. A., on a six months' professional engagement.

**John P. Burrows** has been appointed general purchasing agent of International Minerals & Chemical Corp., Chicago, Ill. Mr. Burrows was formerly assistant general purchasing agent and succeeds **Joseph M. Coppinger**, who died June 19.

**Jacob Vandenberg** and **John S. Holland** have joined the staff of National Lead Co.'s mining department, New York, N. Y. Mr. Vandenberg was formerly managing director of the Holland Metallurgical Works in Arnhem, Netherlands. Mr. Holland was transferred to New York from the company's MacIntyre development.

**H. B. Megill**, Haley, Ont., has been appointed executive vice president and general manager of the Pacific Northwest Alloys, Inc. Mr. Megill was previously general manager for Dominion Magnesium Ltd., Haley.

GORDON B. RUSSELL, formerly assistant treasurer and secretary, has been appointed comptroller and WILLARD R. KIMSEY, formerly assistant treasurer, assistant comptroller of Kennecott Copper Corp., New York, N. Y.

**Ernest R. Gordon**, formerly staff mining engineer, is now chief, Grand Junction, Colo. Exploration Branch, Atomic Energy Commission; **Ralph A. Wilpolt** is chief, Geologic Section, and **Robert J. Wright**, assistant chief; **Quentin E. Conklin** is chief, Engineering Section; **Daniel B. Hurley**, chief, Exploration Engineering Unit; **Andrew J. Shea**, chief, Office Engineering Unit; and **Joseph A. Tavelli**, chief, Technical Services Section.

**Donald E. Moulds**, formerly chief, Base Metals Division, DMPA, has been appointed general manager of the mining division of Copper Range Co. with headquarters at Painesdale, Mich.

**H. H. Heath**, formerly chief accountant and assistant comptroller, is now comptroller of the Baroid Sales Division of National Lead Co., New York, N. Y. **Gordon Robertson** succeeds him as assistant comptroller.

**Paul Diserens**, director of research and development, Worthington Corp., Harrison, N. J., is retiring after 43 years' service.

**A. Todd Davis** has been appointed assistant director, employee relations, Nevada Mines Division, Kennecott Copper Mining Co.

**Lamar Weaver**, superintendent of mines for Tennessee Copper Co., Ducktown, Tenn., has been promoted to general superintendent; **Hugh F. Kendall, Jr.**, to mine superintendent.

**Edward Schmid, Jr.** has been appointed director of public relations and publicity for Reserve Mining Co., Duluth, Minn.

**Frank J. Cservenyak** has been appointed chief of the Light Metals Branch in the Minerals Division, Bureau of Mines, succeeding **H. W. St. Clair**, recently put in charge of the Bureau's alumina demonstration plant at Laramie, Wyo. **Delwin D. Blue**, alumina specialist, is assistant chief.

**Ernest F. Bean**, Wisconsin State geologist since 1925, retired in June. Mr. Bean had been with the Wisconsin State Geological Survey since 1917 and had served as assistant professor at the university.

**W. P. Morris**, Virginia, Minn., previously assistant supervisor of ore beneficiation for Oliver Iron Mining Division of U. S. Steel Corp., has joined Combined Metals Reduction Co. in Utah.

**J. R. Macdonald** has been appointed field manager of Saskatchewan operations for Technical Mine Consultants, Toronto.

From May 15 to October 15, contact **J. F. Myers** at 124 Putnam Park, Greenwich, Conn.; from October 15 to May 15, Bahia-Mar, Fort Lauderdale, Fla.

**Dr. H. J. Fraiser**, vice president and general manager of Falconbridge Nickel Mines, has been elected president of Ontario Mining Association.

## OBITUARIES

**Hugh M. Shepard**, manager of the Baltimore, Md., plant of Asarco, passed away on May 30.

**Frank J. Strachan**, 86, concentrator superintendent for Cananea Consolidated Copper Co., Cananea, Sonora, Mex., from 1903 until his 1946 retirement, died on May 30 as the result of heart trouble.

**William Luther Lewis**, 68, president of the Chicago Pneumatic Tool Co., New York, N. Y., died June 28.

**Guy A. Richards**, 68, vice president of Worden-Allen Co., Milwaukee, Wis., passed away on June 6 in Minneapolis, Minn.

**Irving E. Beckwith**, 39, geologist with Pickands, Mather & Co., died on June 9.

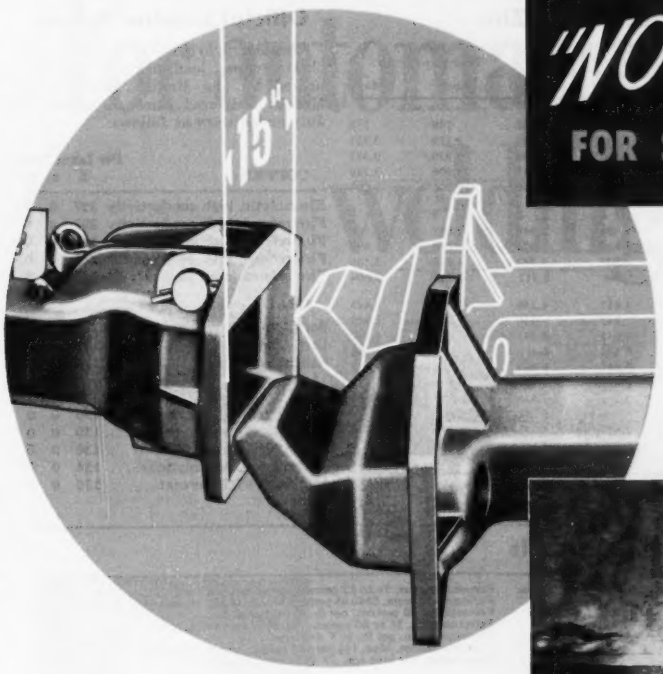
**Thomas Varley**, 72, former U. S. Bureau of Mines official at Salt Lake City, Utah, and Seattle, Wash., and a retired mining consultant, died June 14 in Salt Lake City.

**Fred Knight**, 70, retired from Oliver Iron Mining Division, passed away on June 10.

**Dr. Andrew C. Lawson**, 90, professor emeritus of geology, University of California, passed away at Berkeley, Calif., on June 16. Dr. Lawson made the university one of the world's great centers of earthquake information.

**Harry P. Pearson**, 59, died of a heart attack in Challis, Idaho. Mr. Pearson was president of the Idaho Custer, Silver Summit (which property he developed), Reindeer Queen, and Pearson Mining companies.

# USE "NO HANDS" FOR SAFE COUPLING




Fifteen inch gathering range is one feature which assures automatic operation of the O-B Coupler. Mating heads meet within this range and guide one another as the cars come together. Since the heads seek to center themselves on one another and join securely on impact, car coupling is a "no hands" operation, and workmen keep clear of the between-cars area.

## AUTOMATIC OPERATION PROMOTES HAULAGE SAFETY

Every coupling hazard present when joining cars equipped with ordinary couplers can be eliminated with the use of O-B Automatic Mine Car Couplers. Since mating heads of the O-B Coupler guide each other and seat themselves firmly as they come together, there is no need for a worker to help in any way. Thus a "Hands Off" policy is in effect at all times when cars are made up into trips. With such a rule in force, men are not exposed to the between-cars danger area. Ordinary coupling methods, on the contrary, compel a workman to get between cars to guide parts together and lock them in place.

While it's a good idea to teach "Safety First" wherever possible, it's a better idea to remove potential safety hazards wherever possible. Your coupling method may be one of these places. Keep the safety features in O-B Automatic Coupling in mind when you renovate cars or replace them.

Ohio Brass

MANSFIELD OHIO, U.S.A.

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONT.

4290-AM

 (Continued from page 69)

## U. S. Mine Production of Zinc

Mine production of recoverable zinc, according to the Bureau of Mines, in tons:

| Region and State: | 1951 (monthly average) | 1952 January-March (average) | 1952 April | 1952 May |
|---|---|---|---|---|
| **States East of the Mississippi:** | | | | |
| Southern Illinois and Kentucky | 814 | 685 | 748 | 776 |
| Northern Illinois and Wisconsin | 2,613 | 2,826 | 3,272 | 3,151 |
| New Jersey, New York, Virginia | 9,041 | 10,285 | 9,976 | 9,947 |
| Tennessee | 3,242 | 3,210 | 3,506 | 3,720 |
| | 15,710 | 17,006 | 17,502 | 17,594 |
| **West Central States:** | | | | |
| Arkansas | 6 | 3 | 5 | 5 |
| Kansas | 2,486 | 2,848 | 2,887 | 3,100 |
| Missouri | 880 | 976 | 870 | 1,099 |
| Oklahoma | 4,333 | 4,884 | 4,978 | 5,400 |
| | 7,705 | 8,711 | 8,740 | 9,604 |
| **Western States:** | | | | |
| Arizona | 4,417 | 4,188 | 4,550 | 4,425 |
| California | 755 | 940 | 980 | 1,020 |
| Colorado | 4,642 | 4,544 | 4,174 | 4,540 |
| Idaho | 6,649 | 6,706 | 6,245 | 6,299 |
| Montana | 7,017 | 6,965 | 6,652 | 7,275 |
| Nevada | 1,434 | 1,287 | 1,540 | 1,530 |
| New Mexico | 3,783 | 4,630 | 5,079 | 4,880 |
| Texas | 2 | 1 | ..... | ..... |
| Utah | 2,883 | 3,305 | 3,275 | 3,470 |
| Washington | 1,595 | 1,688 | 1,706 | 1,513 |
| | 33,177 | 34,254 | 34,201 | 34,952 |
| Total, United States | 56,592 | 59,971 | 60,443 | 62,150 |

## Official London Prices

Consumers in the United Kingdom obtain copper, lead and zinc at prices named by the British Ministry of Metals. Delivered prices in effect as July ended were as follows:

| | Per Long Ton £ | s. | d. |
|---|---|---|---|
| **COPPER:** | | | |
| Electrolytic, high conductivity | 287 | 0 | 0 |
| Fire refined, high conductivity | 287 | 0 | 0 |
| Fire refined, high grade | 286 | 0 | 0 |
| Fire refined, min. 99.7 percent | 286 | 0 | 0 |
| Fire refined, min. 99.2 percent | 285 | 10 | 0 |
| **LEAD:** | | | |
| Soft, foreign duty paid | 131 | 0 | 0 |
| Soft, Empire | 131 | 0 | 0 |
| English, refined | 132 | 10 | 0 |
| **ZINC:** | | | |
| Foreign (G.o.b.) duty paid | 130 | 0 | 0 |
| Domestic (G.o.b.) duty paid | 130 | 0 | 0 |
| Prime Western and debased | 130 | 0 | 0 |
| Refined and electrolytic | 134 | 0 | 0 |
| Minimum 99.99 percent | 136 | 0 | 0 |

## Miscellaneous Metals, Ores, Minerals

Quotations cover wholesale lots, prompt shipment, f.o.b. New York unless otherwise stated

### MISCELLANEOUS METALS

July 31, 1952

| | |
|---|---|
| Aluminum, ingot, 99 plus percent, lb. (base price) | 19c. |
| Antimony, spot, lb., 5 tons and up but less than carload, in cases | 42.47c. |
| Bismuth, ton lots, lb. | $2.25 |
| Cadmium, commercial sticks, delivered, lb. | $2.25 |
| Calcium, lb., ton lots, 98 percent, cast | $2.05 |
| Chromium, 97 percent grade, lb., contract | $1.07 |
| Cobalt, 97 to 99 percent, per lb. | $2.40 |
| Indium, troy oz. | $2.25 |
| Nickel, cathodes, lb., f.o.b. Port Colborne (a) | 56¼c. |
| Magnesium, 99.8 percent, carloads, lb., producer's plant, Freeport, Texas | 24½c. |
| Palladium, troy oz. | $24.00 |
| Platinum (Official quotation wholesale lots) troy oz. | $90.00 |
| Quicksilver, flask of 76 lbs., 25 flasks or more | $188 @ $191 |
| Selenium, 99.5 percent, lb. | $3.00 @ $3.50 |
| Silicon, minimum 97 percent, carloads, lb. | 20c. |
| Tellurium, lb. | $1.75 |
| Thallium, 100 lb. or more, lb. | $12.50 |
| Titanium, 99.3 percent, lb. | $5.00 |

(a) Includes U. S. duty.

### METALLIC ORES

| | |
|---|---|
| Beryllium Ore, imported, 10% BeO, per unit | $36.50 |
| Chrome Ore, per long ton, f.o.b. cars Atl. ports, dry 44% $Cr_2O_3$ no ratio | $27.00 @ $28.00 |
| 48% $Cr_2O_3$ 3 to 1 ratio | $44.00 @ $56.00 |
| Iron Ore, Lake Superior, Lower Lake ports, long ton: | |
| Old Range bessemer | $8.70 |
| Mesabi bessemer | $8.45 |
| Mesabi, non-bessemer | $8.30 |
| Lead (Galena), 80 percent, Joplin, Mo., ton | $209.95 |
| Manganese Ore—Per long ton unit of Mn basis 48 percent manganese, nearby positions, subject to premiums and penalties, $1.20 @ $1.22, c.i.f. U. S. ports, duty extra. Long-term contract nominal at 90c. to 95c., c.i.f., duty extra. | |
| Molybdenum Ore, 90%, per lb. of $MoS_2$ f.o.b. mines | 60c. |
| Tantalite, 60% concentrate, per lb. | $2.00 @ $2.55 |
| Tungsten Ore, per unit of $WO_3$ | |
| Foreign, 60 percent, f.o.b. foreign ports | $52.00 @ $54.00 |
| Domestic, scheelite, 60 percent f.o.b. mill | $65.00 |
| Vanadium Ore, per lb. of contained $V_2O_5$ f.o.b. mines | 31c. |
| Zinc Ore, Prime, 60 percent concentrate, Joplin, Mo., per ton | $100.00 |

(a) F.o.b. port of shipment.

### METALLIC COMPOUNDS

| | |
|---|---|
| Arsenous Oxide (arsenic trioxide) lb., in bbl. carload lots delivered | 5½c. |
| Cobalt Oxide, 72½ to 73½%, ceramic grade, per lb. | $1.82 @ $1.84½ |
| Copper Sulphate, 100 lb. | $8.95 @ $9.95 |

### ALLOYS

| | |
|---|---|
| Beryllium Copper, 4 percent Be, per lb. of alloy, 5 lb. ingot | $1.56 |
| Ferrochrome, 65 to 69 percent, per lb. of Cr contained | 21¾c. |
| Ferromanganese, 78 to 82 percent, gross ton, seaboard | $185.00 |
| Ferromolybdenum, 55 to 65 percent Mo. lb. of Mo. contained | $1.32 |
| Ferrosilicon, 50 percent, per lb. of contained Si | 12.4c. |
| Ferrotungsten, 75 to 80 percent, lb. of W contained | $4.85 |
| Ferrovanadium, per lb. of V delivered | $3.00 @ $3.25 |
| Silicomanganese, Max. 1½ percent carbon, per lb. contracts | 9.9c. |
| Spiegeleisen, per long ton, 19 @ 21 percent grade | $75.00 |

### NON-METALLIC MINERALS

| | |
|---|---|
| Asbestos, f.o.b. Canada (Quebec) mines (U. S. funds) ton: | |
| Crude No. 1 | $960 @ $1,500 |
| Crude No. 2 | $595 @ $900 |
| Spinning fibers | $275 @ $475 |
| Shingle fibers | $123 @ $170 |
| Paper stock | $85 @ $119 |
| Waste | $63 @ $70 |
| Shorts | $30 @ $63 |
| Asbestos, Vermont, f.o.b. Hyde Park: | |
| Spinning fibers | $279.50 @ $302.00 |
| Shingle stock | $135.00 @ $162.00 |
| Paper stock | $81.50 @ $115.00 |
| Waste, stucco or plaster | $71.40 |
| Refuse or shorts | $34.00 @ $63.00 |
| Barytes, f.o.b. mines: | |
| Georgia, crude, per long ton | $13.00 @ $13.50 |
| Missouri, 93 to 94 percent $BaSO_4$, per short ton | $10.15 @ $10.40 |
| Bauxite, long ton, f.o.b. point of shipment: | |
| Domestic, crude, 50 to 52 percent (not dried) | (a) $4.50 @ $5.50 |
| Domestic, chemical, 55 to 58 percent | (a) $8.50 @ $9.50 |
| Domestic, abrasive, 80 to 84 percent | (a) $18.00 @ $18.50 |
| China Clay, f.o.b. mines, ton: | |
| Georgia, filler and ceramic grades | $8.50 @ $9.50 |
| North Carolina ceramic grade | $20.25 @ $22.25 |
| Feldspar, bulk ton: | |
| Potash or soda feldspar, 200 mesh, ceramic grade | $18.50 @ $22.25 |
| Glass feldspar, white, 20 mesh | $11.75 @ $12.50 |
| Fluorspar, f.o.b. mines, bulk, 70% effective ton | $43.00 |
| 60% effective $CaF_2$ | $40.00 |
| Acid 97% concentrate, bulk, ton | $60.00 |
| Fuller's earth, f.o.b. Georgia or Florida, ton | $7.00 @ $14.00 |
| Magnesite, per ton dead-burned, bulk, f.o.b. Washington | $36.30 |
| Mica—Domestic, f.o.b. mines. Punch 12 to 22c. per lb. according to size and quality. Sheet, clear, 1½ x 2 inch, 80 to 85c.; 2 x 2 inch, $1.10 to $1.20; 2 x 3 inch, $1.50 @ $1.60; 3 x 3 inch, $1.80 @ $1.90; 3 x 4 inch, $2.20; 3 x 5 inch, $2.40; 4 x 6 inch, $3.15; 6 x 8 inch, $4.25. Wet ground, very fine, $140 @ $155 per ton. Bulk sales, dry ground: $32.50 @ $70.00 per ton. Scrap, $32 and up. | |
| Ocher, Georgia, ton, in sacks | $26.25 |
| Pyrites, Spanish, per long ton unit of S, c.i.f. Atlantic ports | Not quoted |
| Sulphur, Texas, mines, long ton | $22.00 |
| Talc, f.o.b. works, ton: | |
| New York, purified | $18.50 @ $20.00 |
| Vermont, extra white | $12.50 |
| Tripoli, Missouri, ton: | |
| 40 mesh, cream colored | $30.00 |

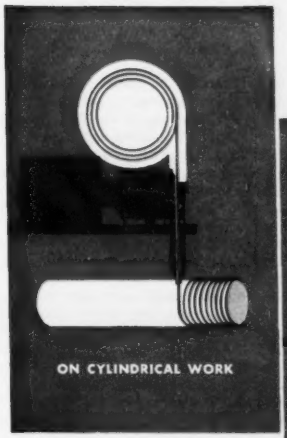
(a) Nominal.

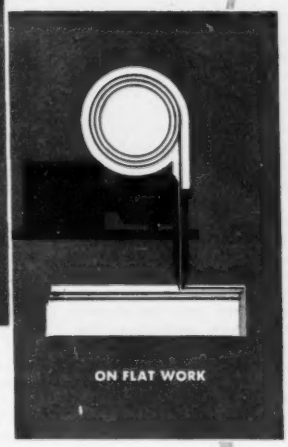
### IRON AND STEEL

| | |
|---|---|
| Pig iron, gross ton, basic, Valley furnaces | $52.00 |
| Steel, f.o.b., Pittsburgh billets, net ton | $56.00 |
| Structural shapes, 100 lb. | $3.65 |

# For automatic welding...

# STOODY 104




## A New Tubular Fabricated Build-up Wire

Stoody 104 was specifically developed to supply properties lacking in high carbon weldments—exceptional strength, ductility, resistance to abrasion and deformation. Designed also as a final overlay for certain types of equipment such as tractor track rails, sheaves, mine car wheels, etc.

Stoody 104 bonds readily to all weldable SAE and AISI steels, forms an ideal underlay for hard-facing alloys. Deposits are readily machinable and respond to heat treatment.

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**STOODY COMPANY**
11940 E. SLAUSON AVENUE,
WHITTIER, CALIFORNIA

# WASHINGTON IMPACT

*Morton A. Reichek, McGraw-Hill Washington News Bureau*

## USBM Gets Okay On Alumina Research
## San Manuel Loan Approved by RFC

THE ECONOMY-MINDED 82nd Congress treated the Bureau of Mines with kid gloves. It appropriated the $27.6-million requested by the agency for fiscal 1953. That's a boost over the previous year's $24.4-million budget.

No big programs will be initiated by the 1953 budget, but two research projects got powerful shots in the arm:

1. The Bureau's alumina plant at Laramie, Wyo., which received $1-million to demonstrate the feasibility of producing metallurgical alumina from anorthosite rock;

2. The Bureau's research laboratory at Reno, Nev., which got $750,000 for work on rare and precious metals in the Sierra Nevada mining region.

The appropriation for the Laramie plant was bitterly opposed as "wasteful . . . and fruitless" by the Monolith Portland Midwest Co. of Los Angeles, which has a cement plant in the Wyoming city. The company developed the alumina production process as a by-product of its cement manufacture. During World War II, the government began building a pilot plant in Laramie for Monolith, the company having the right to buy the plant upon termination of the war contract. The war ended before the plant's completion.

The Bureau of Mines took over the plant site in 1951, and finished construction with a $350,000 appropriation. The new $1-million appropriation will be used to see whether Monolith's Alumina Process is commercially practicable. The company says it has already proved the process successful, and is suing for the right to buy the Laramie plant.

The Bureau's $750,000 appropriation at Reno will be used to construct a new building on the University of Nevada campus. Beneficiation will be conducted on such Sierra Nevada ores as antimony, asbestos, chromite, fluorspar, manganese, sulphur, talc, and tungsten, which, the Bureau says are "more refractory to treatment and much lower in grade than could have been conceived a few years ago."

### Stockpiling Gets Funds

Before adjourning, Congress appropriated $203.9-million in new funds for the strategic stockpile in fiscal 1953. The General Services Administration and the Munitions Board had requested $225-million.

Including unobligated funds carried over from fiscal 1952, $683.9-million is now available to the stockpile. At least 90% of this sum will be used to buy metals and minerals. Reason for the huge carry-over in funds: GSA has been unable to buy the quantities of strategic materials it wants; the National Production Authority allocated the bulk of available supplies to manufacturers of defense goods.

Stockpile purchases totaled $2.1-billion as of May 1. At current market prices, the materials in the stockpile were valued at $3.5-billion.

Still remaining in the Defense Production Act kitty are $1.1-billion for all mobilization functions covered by the law, including the Defense Materials Procurement Agency's actual purchases of metals and minerals or commitments to buy. The original act of 1950 earmarked $2.1-billion, of which $1.8-million has already been certified to DMPA.

Congressional committees had a lot to say about tin and aluminum last month, with kind words for the Reconstruction Finance Corp., and unkind ones for the Defense Production Administration.

RFC officials were painted as knights in shining armor. in a report by Sen. Lyndon Johnson's Preparedness Subcommittee of the Senate Committee on Armed Services, for their struggle with the "ruthless international tin combine" on prices.

Said the committee about RFC's successful tin negotiations:

"The importance of this lesson cannot be overestimated. For too many years, the U.S. has been considered in some quarters an 'easy mark'—fair game for any economic buccaneer who could seize control over one or more of the world's vital resources. That picture was considered an accurate representation not only by the great international combines, but by some of our own leading citizens who should have known better.

"The myth of American helplessness against restrictive world economic combinations has now been smashed and smashed irrevocably. Furthermore, it has been smashed in the face of adverse circumstances that could hardly have been made more difficult."

The Malayan Tin Bureau, in Washington, immediately flayed Sen. Johnson's report as "unfounded" and "distorted." Commenting on RFC's tin negotiations, it said: "The Malayan tin producers desire that their product remain a normal commercial commodity dealt with through normal commercial channels. Malayan tin producers object to any artificial barriers that result in a shortage of tin metal for any industrial needs of orderly strategic stockpile accumulation. Such artificial barriers needlessly place tin in the category of an international political problem and are against the true interests of consumers."

The Joint Committee on Defense Production turned thumbs down on a proposed government long-term procurement agreement with the Aluminum Co. of Canada. It castigated Samuel W. Anderson, DPA's deputy administrator of aluminum, for ignoring stockpile goals in his mad rush for a deal with Alcan.

The committee bluntly stated: "DPA (should) devote as much of its energy and resourcefulness in the months ahead to the establishment of new U.S. (aluminum) producers as it has since February to the promotion of the Alcan proposal."

### San Manuel Gets Loan

San Manuel Copper's $94-million loan was finally okayed after three months of haggling with RFC over how much private money must go into the Arizona project. The outcome: Magma Copper, San Manuel's parent company, will put up about $17.2-million, which is the difference between the actual loan and the amount for which the loan application was made. RFC also prodded Newmont Mining Corp., which holds 22% of Magma's stock. Newmont was reluctant to get into the act in a big way; Magma makes up less than 5% of its total holdings.

Magma has already invested $10-million for exploratory work. The additional investment of private funds must be made prior to disbursement of any government money, according to RFC's terms. Magma is putting everything it can into the project, and is confident of developing a successful operation.

RFC played tough on the loan, the largest single business loan it has ever made, for this obvious reason: its dubious reputation after last year's disclosures of influence-peddling on loans. RFC was particularly worried that a loan of such proportions to a "relatively small company" would look risky.

When San Manuel reaches full production in 1957, it will be one of the nation's top seven copper producers. Its operations will boost domestic output 8%. In addition to 140-million

lb. of copper a year, the San Manuel mine will produce 6-million lb. of molybdenum. RFC's loan runs for 20 years; the agency anticipates repayment in less time, however. In addition to an underground mine, San Manuel will build milling and smelting facilities at the project, utilities, transportation facilities, and a town site.

### The Manganese Program

GSA is pessimistic about its small-lot manganese purchase program, which was announced last month. The agency doubts that it will reach its target of 19-million long dry tons by June 1956, or make a dent in imports (90% of U.S. manganese supplies), or permit the build-up of private inventories.

But GSA is going ahead, for it wants to provide a stimulus for: (1) small U.S. producers who mine less than 10,000 tons a year; (2) exploration that would open up more domestic mines; and (3) research on new chemical processes to recover low-grade ores.

Under its small-lot buying program, GSA will pay small producers at least twice the current market price for manganese. Its basic price: $2.30 per long ton unit of manganese in ore or concentrates with 48% manganese. GSA will also pay for transporting the ore from the rail point nearest the mine to the ultimate consumer. The miner will pay only for trucking the ore to his nearest rail point. The ore will be allocated directly to a consumer, not to the stockpile. The consumer will pay the market price—the government swallowing the loss.

Here's the rub that makes GSA pessimistic:

The specifications are exceedingly high. Small producers' ore must contain a minimum of 40% manganese to qualify under the program. GSA expects loud protests on this, but officials are adamant about maintaining the high specifications. Their reason: The ore is being consigned for immediate consumption, and the government hasn't the facilities to beneficiate it.

Ore with a manganese content of 15% is the lowest acceptable grade at the GSA purchasing stations. GSA figures this will be milled eventually, and doesn't have to be in useable shape right now.

The stockpile situation on manganese, incidentally, is "not too favorable," according to GSA. As in other metals, high industrial needs have left the stockpile a meager share.

GSA expects the premium price on manganese to open up many small mines not now in operation, but the agency doesn't expect much in Maine, which has an estimated reserve of 275,000 tons of ore, for there's still no commercially satisfactory process to treat Maine's high silicon-content ore. However, GSA thinks the new buying program will push the experimental work into high gear.

# LABOR THIS MONTH

***Joseph M. Gambatese, McGraw-Hill Washington News Bureau***

**COPPER NEGOTIATIONS:** Wage talks in copper dragged during July while both sides watched the long steel strike. Expired contracts were extended only on a day-to-day basis, permitting strikes at any time. A Mine-Mill wage policy meeting in Denver backed up demands for a $2-a-day raise. The industry stood firm against any wage rise. Kennecott offered six improvements in the contract, including a better pension plan than was offered last year and an offer to help finance medical coverage for families of employees.

**T-H INJUNCTION?** Truman's stubborn refusal to use the Taft-Hartley 80-day injunction to end the steel strike even after Congress said he should, raises the question whether he would use it in the event of a copper strike. He used it last year when Mine-Mill refused to call off its strike while WSB considered the dispute. As we see it:

Truman won't invoke the injunction to prevent a copper strike.

If a copper strike begins, he won't use the law until the strike has run at least a few weeks, if then. There is an election in November.

**LAX WAGE CONTROLS:** Congress extended wage controls until April 30, but punched some big holes in the wage lid. Never tight before, you can expect wage controls to be applied loosely. Any settlements reached in copper, lead, and zinc this summer will likely be approved, irrespective of regulations. Mine, Mill and Smelter Workers union is counting on this.

**WHAT CONGRESS DID:** On wages and salaries, Congress exempted from control: (1) employers of less than nine, except where President Truman makes exceptions; (2) any pay under $1 an hour; (3) farm workers; (4) most professional engineers, architects and accountants. On labor disputes, it told WSB to keep hands off, except to give "advice" when asked, on how wage policies apply to a particular dispute.

**WHAT WSB WILL DO:** The new WSB will develop a policy approving increases of about 4¢ an hour, based on increased productivity, above the rise in living costs. It will leave the door wide open on all fringe benefits, just as was done with pensions and welfare benefits. WSB's funds have been cut sharply. This will encourage loose control.

**ANACONDA WAGES:** The Bureau of Labor Statistics has been publishing a series of studies itemizing the changes in wages and fringe benefits negotiated, year to year, by major companies and unions. The latest, wage chronology No. 26, covers Anaconda Copper Mining Co.'s agreements with Mine-Mill since 1941, and appears in the July issue of the *Monthly Labor Review*, a BLS publication. On direct wages, the chronology shows that daily wages have risen an average of $7.65 in 10 years. Present wages range from $12.20 a day for laborer's helper to $15.62 for boss machinist and boss carpenter.

**PRODUCTIVITY IMPROVES:** Output-per-man-hour in copper, lead, and zinc primary smelting and refining continued its upward trend in 1950. It was the highest of any of the years since 1939 covered by a BLS study. BLS doesn't say who deserves the credit—management, labor or machines. You can get the study from BLS. Ask for "Productivity Trends in Primary Smelting and Refining of Copper, Lead and Zinc, 1939 to 1950."

**AROUND MINE-MILL:** A new history of the union is being written. The one issued in 1944 is no good. It praises the CIO, urges all-out production for war. . . . Plans are being made for opening the 48th convention this week in New York, Sept. 8. . . . They say former president Reid Robinson is an electrical appliance salesman in California.

**MANPOWER:** Defense Materials Procurement Agency looks for the draft to pull more miners into service this fall, may make another attempt to get blanket deferment for metal miners. . . . Manpower analysis forms are being circulated. Objective: Try to anticipate location and extent of manpower shortages before they occur.

**UNION INITIATION FEES:** The National Labor Relations Board has laid down two rules about unions charging higher entrance fees to some workers:

1. They may charge a higher fee for reinstatement than they charge first-time members, although it cannot be "excessive." (Food Machinery & Chemical Corp.)

2. They may not charge higher fees to workers who do not join the union until they are forced to under a union shop contract. (Bendix Aviation Corp.)

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# THE BLASTER

*CRUCIBLE HOLLOW DRILL RODS*

In rock-drilling operations, the blaster is a key man. He plans the blast, tells the drill-runners where to drill their holes, loads the charge for the greatest effectiveness.

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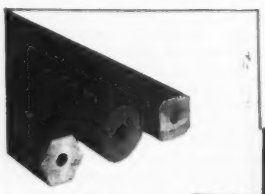
Crucible Hollow Drill Rods are right for the job because they are made by the world's largest producer of *tool and high speed steels.* From this metallurgical experience come the high mechanical properties that have set record after record for least cost per foot drilled. Use Crucible Hollow Drill Rods in all your drilling operations.



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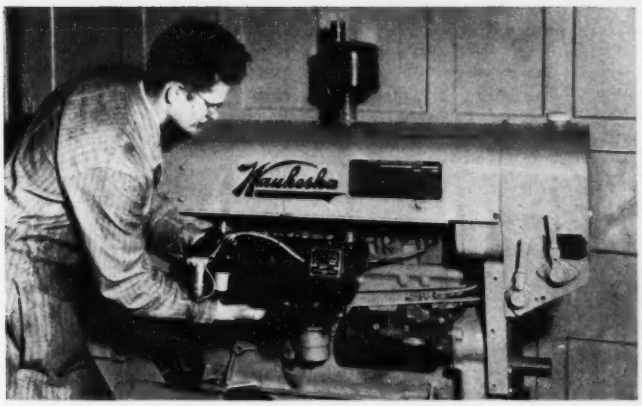
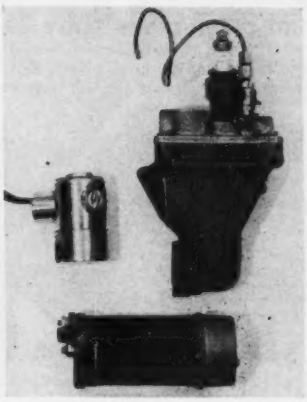
# NEW PRODUCTS DIGEST

*For further information on these products, circle item numbers on card-inserts and mail.*

## FEATURE




**PRE-HEATER for diesel engines accomplishes the following objectives for quick engine starting at —65 deg F.; (A) minimizes resistance to cranking so that starter can turn engine fast enough; (B) augments ignition system for fuels difficult to ignite at —65 deg. F.; (C) warms oil for good lubrication. (1)**



**GASIFIER for gasoline engines (upper right) is 5½ in. high. Accessories are electric valve (upper left) ignition coil (bottom). (2)**

# Faster Cold-Weather Starting For Your Engines

WINTER TEMPERATURES, down to —65 deg. F., long a bugaboo for gasoline and diesel engines, may be whipped by two devices recently developed for quick starting at low temperatures.

**For Diesel Engines:** After preheating from 25 to 75 minutes with a Stewart-Warner vehicle heater, a six-cylinder diesel engine can be started with less than one minute's cranking. The system, developed by Stewart-Warner in cooperation with military agencies, introduces clean air, heated to about 400 deg. F., into the interior of the engine through a preheater which warms the air and fuel vapor and prevents condensation of fuel on cold manifold and combustion chamber walls.

Heating the lubricating oil to provide normal lubrication when the engine starts, is accomplished by a heat exchanger built into or around the sump. Heater exhaust or the 400 deg. air supplies heat.

For further information about this diesel engine preheating equipment made by Stewart-Warner Corp., Chicago, Ill., circle No. 1 on the card opposite page 118, tear out, and mail.

**For Gasoline Engines:** A new device, the gasifier, according to a U.S. Army release, enables gasoline engines to start in less than 30 seconds in temperatures as low as —65 deg. F., without use of an external heating source. Developed by Robert Reichhelm Co., Stratford, Conn., for aircraft engines, Army Engineers feel it may be the answer for their equipment in cold weather.

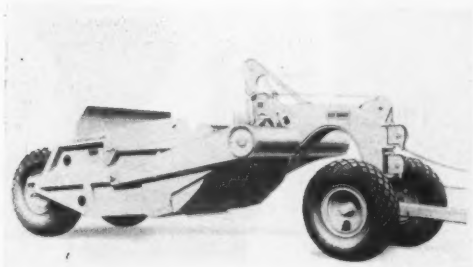
The gasifier supplements the carburetor for starting only. It is essentially a fuel pre-combustion chamber with a spark plug. A part of the fuel supplied is burned under controlled conditions to heat and vaporize the main portion. The resultant rich, warm, gaseous priming charge is sucked into the engine upon cranking to aid combustion independent of carburetor action.

Adequate cranking power is necessary for successful operation, and Arctic lubricants of low viscosity must be used in the crank case. The gasifier is inexpensive, easy to install and has no moving parts.

For further information on this device, circle No. 2.

**SIDE-DUMP TRUCK BODY** known as the "Roll-Over," dumps either right or left mechanically. Bodies of 10 gauge steel can be mounted on all standard trailers. Self contained subframe will withstand severe service. Galion Allsteel Body Co., Galion, Ohio. (3)

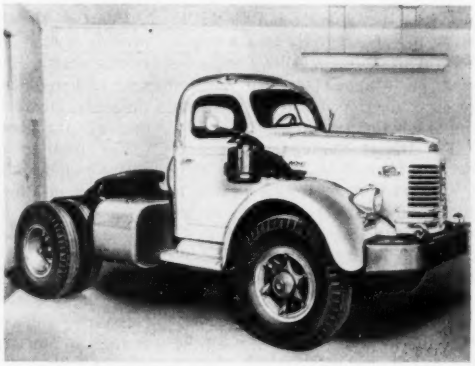
**TOURNATRACTOR** with 3 x 15-in. massive billet serves as pusher units on dozer. A-frame and dozer controls omitted. R. G. LeTourneau, Inc., Peoria, Ill. (4)



**SCRAPER** for use with D6 tractor has flat-bottom bowl and stinger blade engineered for loading and finishing characteristics. Capacity 7 cu. yd. struck; with extension 8.3 cu. yd. Caterpillar Tractor Co., Peoria, Ill. (5)

**SCRAPER** has 19 cu. yd. capacity struck, 22 heaped. Rapid loading is claimed for latest application of the "boiling bowl principle." Side cutters are manganese steel. Woolridge Mfg. Co., Sunnyvale, Calif. (6)

**REAR-DUMP WAGON** features stable wheel base. Four-wheel air brakes permit backing unit over edge of fill in safety. Top speed is 22 mph. LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa. (7)



**DIESEL TRUCK** has 50,000-lb. gross tractor rating, weighs less than 10,000 lb. to make it one of the lightest units in its class. Made by Reo Motors, Inc., Lansing, Mich., it uses a Cummins engine. (8)

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Thermoid's long experience and continuing research *in the field*, pays off with real economy, maximum efficiency and greater tonnage for your belting dollar. Regardless of the size or kind of material—light or heavy, soft or abrasive, hot or cold, wet or dry—whatever the job, it's a good bet that Thermoid has solved the same or a similar problem with a belt that will do the job better.

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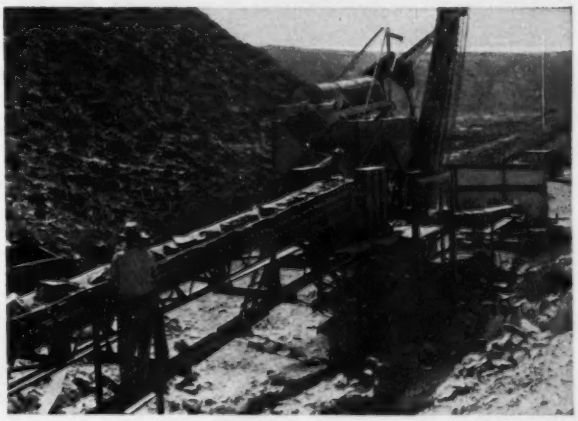

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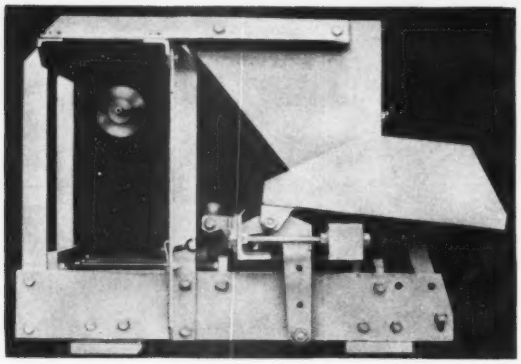
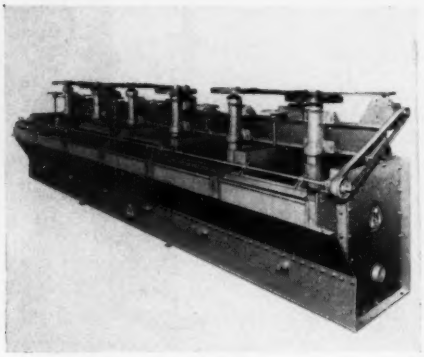
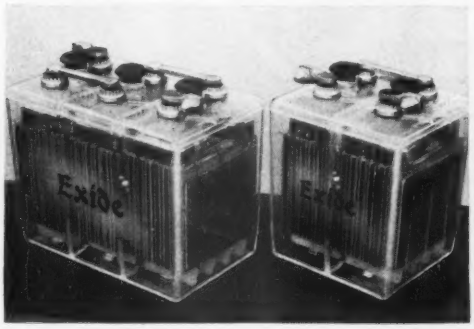


**FEEDER** (tradenamed "Velofeeder") uses high amplitude vibration and high frequency (1850 vib. per min.) to maintain high feed rate. Has manual flow rate adjustment from zero to maximum. Henry Simon, Ltd., England. (9)

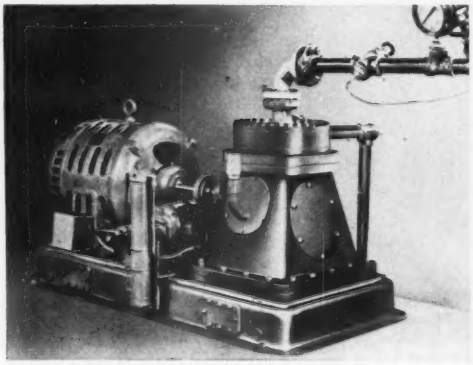


**FLOTATION MACHINE** has a capacity of 50 cu. ft. in each of six cells and is driven by three 10-hp. motors. Weighs 21,000 lb., requires 6 x 26 ft. floor space. Denver Equipment Co., Denver, Colo. (10)

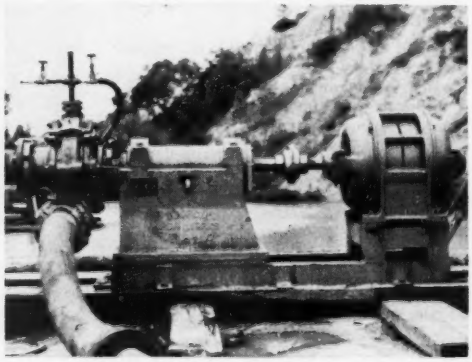



**STORAGE BATTERY** has transparent polystyrene plastic case. Percent discharge of battery is indicated by successive sinking of colored balls floating on electrolyte. Electric Storage Battery Co., Phila., Pa. (11)

**POWERED HAND TRUCK** for horizontal transportation of skids and skid loads has 26½ x 42-in. platform with 3 in. of lift. Has 5 in. underclearance. Yale & Towne Mfg. Co., Philadelphia, Pa. (12)



**CENTRIFUGAL COMPRESSOR** handles gases in high pressure systems at 600 psi. and higher. Operates at flows as low as 125 cfm. Particularly adapted to fluidizing powdered material. Sawyer-Bailey Corp. (13)



**SLURRY PUMP** for handling finely divided materials uses abrasive resistant alloy, Gasite, for parts. Unit features improved bearing and shaft assembly arrangements. Georgia Iron Works Co., Augusta, Ga. (14)

# For Your Files

This informative manufacturers' literature is free unless otherwise specified. To obtain bulletins circle their numbers on card below and mail.

**DIESEL CONTROL.** Wall and floor-mounted cabinets with necessary alarm and shutdown devices to safeguard operation of stationary diesel engines, are described in Bulletin #4806-B released by National Supply Co.'s Engine Div., Springfield, Ohio. (41)

**TRACTOR MAINTENANCE.** "Prevent Down Time" compares preventive maintenance to preventive medicine—both try to reach the patient in time to avoid trouble. Bulletin 30374 of Caterpillar Tractor Co., Peoria, Ill., shows the types of service that Caterpillar dealers stand ready to give to save you down time. (42)

**MOTORIZED HEAD PULLEY.** This eight-page bulletin gives you the advantages of using the Schrock motorized head pulley to drive your conveyor. With a detailed drawing, replacement parts list, and photos of typical installations. Cuba Mfg. Co., Benicia, Calif. (43)

**GAS AND LIQUID ANALYZER.** For rapid automatic analysis of fluid mixtures, precise control of continuous or batch-type processes, and accurate measurement of toxic contaminants in atmospheres, Mine Safety Appliances Co. offers the MSA infra-red gas and liquid analyzer and tells you all about it in Bulletin No. 0705-1. (44)

**HYDRAULIC EQUIPMENT.** The full line of oil hydraulic equipment made by Superdraulic Corp., Detroit, Mich., is described and illustrated with photos and layout drawings in this catalog. (45)

**HYSTER ACCESSORIES.** How to lower costs and improve material handling with attachments, tools and accessories for the Hyster industrial trucks now working for you is discussed in a 24-page brochure issued by Hyster Co., Portland, Ore. (46)

**LIQUID DRIVES.** Fluid drive units for almost every application are discussed with performance charts and tables as well as diagrams in bulletin offered by G. E. Nelson Co., Liquid Drive Div., Holly, Mich. (47)

**SPEED REDUCERS.** Comprehensive 28-page bulletin describing complete line of Crofts "Radiation" fan-cooled speed reducers, featuring a universal mounting arrangement, is available from National Transmission Products, Inc., New York, N. Y. Gives details, operating data, typical installations. (48)

**FEEDERS.** Loss-in-weight, gravimetric feeders for dry materials are described in a four-page bulletin from Omega Machine Co., Providence, R. I. Bulletin discusses operation, feeding range, vibratory feeding mechanism, synchronous motor, feed rate control, and hopper mounted on a specially built Omega pipe lever suspension scale. (49)

**BIN LEVEL INDICATOR.** Mounted on the outside of your bin, the Bin-Dicator automatically indicates the level of material in the bin, controls the level and the feeding machinery. Can also be suspended inside bin. Bulletin gives all installation and operation details. Bin-Dicator Co., Detroit, Mich. (50)

**OVERLOAD RELEASE.** Trimatic overload release for the Dodge torque arm speed reducer loosens the belts, cuts off power and gives a warning when an excessive load is applied to your machine. Bulletin A-616 from Dodge Mfg. Co., Mishawaka, Ind., gives you all the details. (51)

**TURBO-DRYERS.** Advantages, construction and applications are covered by text, illustrations and diagrams in a four-page bulletin from Wyssmont Co., Long Island City, N. Y., which describes these continuous, vertical, transfer type Turbo-Dryers. Units handle fragile or heat sensitive materials ranging from thick slurries to fine powders, through repeated piling and spreading. (52)

**HOSE ASSEMBLIES.** What's your hose problem? Hydraulic paints and solvent spray, lubrication? This eight-page bulletin on industrial rubber hose assemblies is filled with facts and figures to show you how the products of Carlyle Rubber Co., Inc., New York, N. Y., can help solve the problem. (53)

**PLASTIC PIPE.** Light weight, high corrosion resistance, ease in handling and storing, ease of installation, are listed as advantages of Johnsonite No. 4 plastic pipe which is described fully in catalog 354 from Johnson Plastic Corp., Chagrin Falls, Ohio. (54)

**CONTROLS.** Quick reference, eight-page guide helps you select proper electric or electronic controls, devices and accessories. This General Electric Co. Bulletin GEA-5781 contains photos, engineering data and lists additional publications for more complete information on the various items. (55)

**ELECTRIC POWER DRIVES.** Comprehensive 20-page catalog contains descriptive information on variable speed drives, geared motors and con-

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to obtain further information on products and bulletins mentioned in the New Products Digest. Circle item numbers, tear out and mail.

Not good after November 1, 1952, if mailed in U. S. or Canada.

Engineering & Mining Journal—August, 1952
NOT GOOD AFTER NOVEMBER 1, 1952—If mailed in U. S. or Canada

**Please send me the catalogs or further information about the items from New Products Digest whose numbers are circled.**

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stant normal speed motors in drip-proof, splash-proof, totally enclosed, and pipe ventilated designs. Sterling Electric Motors, Inc., Los Angeles, Calif. (56)

STEREOMICROSCOPE. Catalog tells you all about this new microscope that gives you three-dimensional magnified images to help in interpretation. Details and applications are discussed and described. Bausch & Lomb Optical Co., Rochester, N. Y. (57)

V-DRIVE SELECTION GUIDE. Selection of proper V-belt drive can be made quickly and accurately with the aid offered by Fort Worth Steel & Machinery Co., Fort Worth, Tex., in their Engineering Guide #50-A. Simple formulas are augmented by tables. (58)

SURFACE TENSION METER. The "Sur-Ten" meter is a simple, practical device which enables anyone to make quick and accurate surface tension measurements under production conditions. Any measurement takes less than five minutes. There's no fuss with capillary tubes, corrosive cleaners, stop watches and tedious drop counts. A four-page folder tells you how it works and how it's used. Joseph B. Kushner, Stroudsburg, Pa. (59)

FOUNDRY MECHANIZATION. How a foundry or smelter can be mechanized for increased production, better castings and improved working conditions is given the full treatment, with actual case histories, layout drawings and installation photographs. Circle No. 60 on the card below to get Book No. 2439, published by Link-Belt Co., Chicago, Ill. (60)

BATTERY. You'll want to read all about this new type battery that uses Varlenite sheets between the plates to form a compressed porous cushion like a cake. Varlenite holds 75% of its volume in electrolyte and thus stays wet as long as any water remains in the battery. This means battery plates can be made full length and there is no free acid splashed out to cause corrosion. An interesting booklet on the Varley storage battery is available from Chicago Forging and Mfg. Co., Chicago, Ill. (61)

ELECTRICAL EQUIPMENT. Four-page folder gives the highlights on generators, motor-generators, converters (dc to ac) and ac-dc power plants, made by Kato Engineering Co., Mankato, Ill. (63)

# Equipment Shorts

MULTI-PURPOSE GREASE. A new multi-purpose grease called "Texaco Multifat 2" suitable for bearing lubrication over a wide range of temperatures has been introduced by The Texas Co., New York, N. Y. (21)

WIRE ROPE SPLICER. The new and improved model, Torquemaster No. 10 wire rope splicer is designed to handle ⅜ in. to 1¼ in. rope. It has four times the frictional braking surface of the former model, No. 9. The resistance regulator, to enable the operator to overcome cable torque, has been redesigned and relocated to provide precision adjustment. The Torquemaster is made by Quay Industries, Washington, D. C. (22)

ALUMINUM FITTINGS. For the first time, Parker Appliance Co., Cleveland, Ohio, will produce a standard-stock line of aluminum tube fittings for strictly industrial applications rather than aircraft use. The line includes male and female connectors, elbows, tees, union and tube end reducer for ¼, 5/16, ⅜ and ½ in. outside tubing. (23)

LITHIUM-BASE LUBRICANT. New lithium-base lubricant is said to combine advantages of positive water resistance with an extremely high melting point, providing tenacity to metal under the hottest operating conditions. Packaged in 400-lb., 100-lb. drums and 35-lb. pails by D-A Lubricant Co., Inc., Indianapolis, Ind. (24)

ELECTION SPECIAL. Without obligation you can get a folder called "Presidential Elections, 1860 to 1952", from Bemis Bro. Bag Co., St. Louis, Mo. The folder shows how all the states have voted since 1860. You will also receive before the election, a second folder on which you can keep score on election night. If you want these items, free, just circle No. 21 on the card below and mail the card. When election day comes you'll be able to keep up with every development. (25)

MILL DISCHARGE. New Allis-Chalmers grinding mills are now equipped with an improved discharge diaphragm for long wear, and quick, safe assembly. Features of the new diaphragm include curved lifting wings to promote best discharge conditions after material passes through grate sections; grate sections supported on ends and under each bolt; bodies of bolts protected by bosses; heavily ribbed grates and center wearing plate, and a filler bar which makes possible removal of grate section without disturbing adjacent shell liner. (26)

POLYETHYLENE FITTINGS. Polyethylene flanged pipe fittings in sizes up to 6 in., made throughout of fully welded construction are now furnished by American Agile Corp., Bedford, Ohio. The fittings are resistant to the most corrosive chemicals and their marketing demonstrates the growing application of polyethylene for the mining industry. (27)

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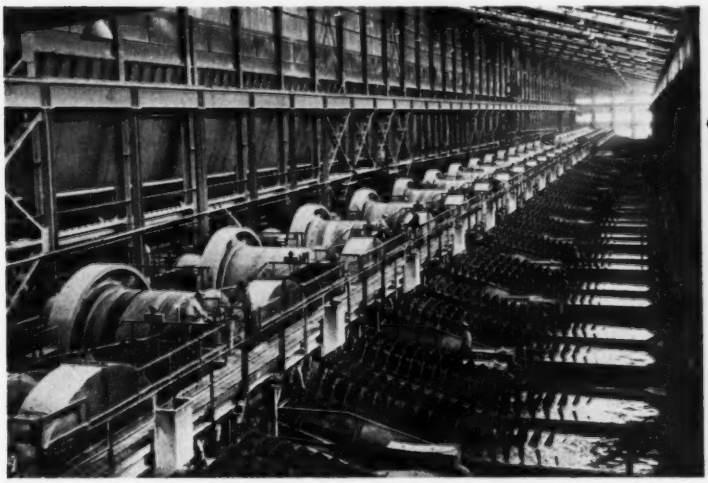
# repeat orders

## proof of Akins' High-Capacity Low-Cost performance

The many successful mining companies which continue to place repeat orders for Akins classifiers provide proof that the Akins design gives dependable low-cost-per-ton performance. The short pitch of the Akins spiral gives up to 50% more capacity than other types. The simple but rugged construction results in minimum maintenance and down time.



*At one of this company's properties 54 54" Akins Duplex Classifiers, in closed circuit with 27 10' x 10' Marcy Grate Discharge Mills, are handling in excess of 50,000 tons per day.*

**for example:**

### 16-54" AKINS DUPLEX CLASSIFIERS— 12TH ORDER FROM LARGE ARIZONA COPPER PRODUCER

Based on actual Akins performance for several years this company has placed 11 repeat orders—now have ordered a total of 110 Akins Classifiers, 32-78" Simplex and 78-54" Duplex.

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**Licensed Manufacturers:**
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HEAD, WRIGHTSON & CO., LTD. ..... STOCKTON-ON-TEES, ENGLAND
HEAD, WRIGHTSON & CO., S. A. (PTY.), LTD. ..... JOHANNESBURG

**Sales Agents:**
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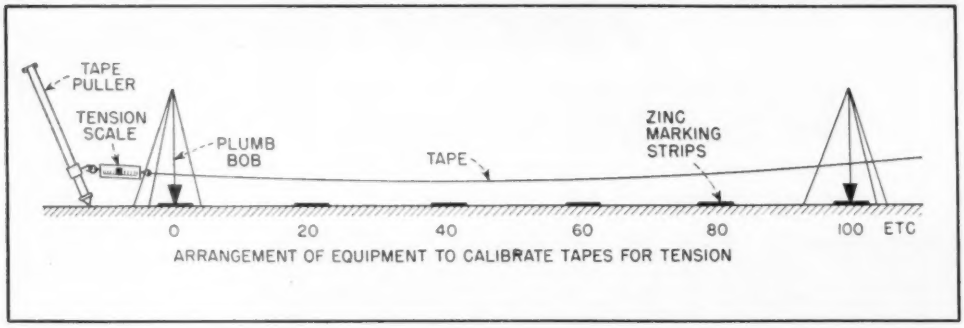
CONTINENTAL SALES AND EQUIPMENT CO. ..... HIBBING, MINNESOTA
EDW. J. NELL CO. ..... MANILA, P. I.
WRIGHT BROS., CREDIT FONCIER BLDG. ..... VANCOUVER, B. C., CANADA

# OPERATING IDEAS



ARRANGEMENT OF EQUIPMENT TO CALIBRATE TAPES FOR TENSION

## A Temperature-Tension Tape Chart For High Precision Surveying

DANIEL C. SHEWMAN
Mining Instructor
West Virginia Institute of Technology

TWO FREQUENT CAUSES of survey inaccuracies are: (1) Failure to correct tape measurements for temperature changes, and (2) Failure to maintain correct tension of tape while measurements are being made.

**Temperature correction.** Few people realize the size of errors created by failure to make temperature corrections. Tapes are made to measure correctly at 68 deg. F. If taping is done at 10 deg. F., or if the tape is heated to 130 deg. F. by a hot summer sun, the error caused by change in length in both cases amounts to .08 ft. per 200 ft. This causes a hidden limit of accuracy in these instances of 1 ft. per 2,500 ft., which is poor. Such an error spoils the accuracy of survey loops or tie-ins made in cold weather which join summer work. Hence, it is virtually impossible to correct this type of error without re-taping the entire network. Yet when this mistake occurs, many surveyors look for single-tape reading errors which probably do not exist in sufficient size to rectify the lack of precision.

The obvious remedy is to use temperature correction charts more frequently, and this point will be discussed in greater detail later.

**Tension correction.** Too many engineers have the notion that constant tension is required regardless of the amount of tape span. This faulty procedure may cause distances to be either too long or too short by as much as 0.10 ft. per 200, or 1 ft. per 2,000 which is not acceptable for precision surveying. The tension chart discussed later solves this problem.

Differences between tapings made by large and small engineers may also cause bad closures, especially if the small engineer runs the survey one way, and the large engineer finishes the closure. The difficulty here, of course, is the tendency of the large man to overstretch the tape, and the small man to understretch it.

Another tension problem is introduced when tapes are repeatedly stretched, kinked, or worn thin, and lose tensile strength as a result. This may cause a permanent "set" or elongation. If the tape is thin, but not "set," its value as an accurate measuring medium may not be altered. A slight elongation can be compensated by decreased tension. If not, the tape should not be used for precise work.

### Graphs Are the Solution

Accurate taping is easily obtained by tape calibration and temperature graphs. The purpose of the calibration is to ascertain the proper tension for any length span of tape. The temperature graphs enable a transitman to adjust in the field his tape readings to temperature changes.

The calibration site universally available is an evenly graded road —preferably macadam and preferably flat. The best permanent site is a seldom-used drift or entry of a mine where the air temperature is fairly constant and where sunlight cannot cause erratic or abnormal tape temperatures. A **new or seldom used tape** should be used in making the calibration site.

### Procedure

1. Place the tape flat on the road or mine floor so that it is 100% supported.

2. Using a tape puller and tension scale, apply the tension required for 100% support as specified by the tape manufacturer. For a K & E tape, this figure is 10 lb. for any tape of 100 ft. or less, and 20 lb. for those over 100 ft. in length.

3. Take zinc strips about ½x4 in. and place them laterally by the tape, at zero, 20, 40, 60, etc., ft.

4. Tack the strips down for permanency, or to prevent their being scuffed or moved during the test.

5. Record the tape temperature and calculate the temperature correction for each distance from the zero.

6. With proper tension again applied, and watching the zero carefully, transfer the foot mark to the strips with a sharp pointed instrument. Apply temperature correction and relocate each mark. Scratch the foot number on the strip. The apex of a "V" is the easiest mark to plumb which will not be misleading.

7. Place a plumb bob held by a tripod exactly over the zero mark on the first strip. A spad and plug in the tripod head obviates the need of a transit.

8. Place a similarly supported plumb bob over the last mark.

9. Using the tape puller and tension scale, suspend the tape between the two plumb bob strings and record the tension required to make the zero and appropriate tape marks coincide with the two strings. Record the distance also.

10. Move the second setup to the next strip towards the zero strip and repeat.

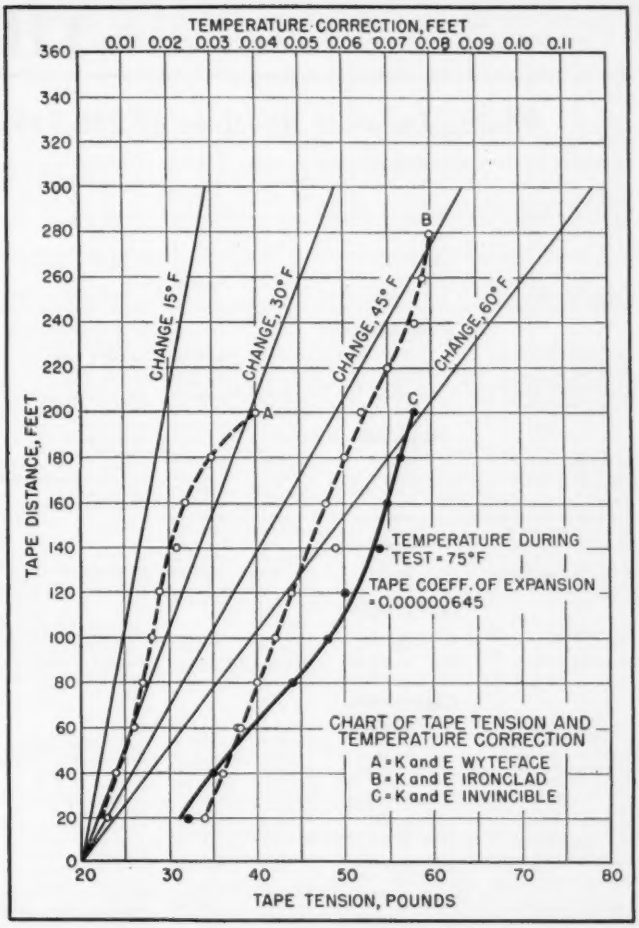
11. Measure and record the tensions of the remaining distances.

The obtained data, plotted on graph paper, will create points which can be joined or approximated by a gradual curve. Any single point not near the curve should be ignored. Even slight errors in markings or setups will cause noticeable discrepancies between points. The discrepancy becomes greater with the shorter distances. This is explained by the fact that a small error made at 20 ft. is accommodated by much greater tape tension than an error made at 200 ft. Plainly visible on the curve, place the temperature of the tape during the test.

Also in the tension versus distance graph, a temperature correction chart should be drawn. A curve for each 15 degree change in temperature up to 60 or 75 deg. is satisfactory. The average coefficient of expansion for a steel tape is nearly 0.00000645 ft. per foot of tape per deg. Fahrenheit. (See *Elementary Surveying* by Breed and Hosmer.) Thus in 200 ft., and for every 15-deg. difference, there will be a correction factor of 0.01935 ft. The 30, 45, and 60-degree-difference curves will have a correction factor, at 200 ft. of 0.0387, 0.0581, and 0.0774 ft., respectively.

The accompanying tension and temperature chart was made from tests of three different types of tapes, and using zinc strips tacked to macadam road. The three tension curves indicate the difference in reactions each tape has to applied tension. **There should be one tension-temperature chart for each tape,** small enough to fit the inside cover of the field book.

Each surveyor should have his own set of field books in which are glued the charts for the tapes he is apt to use. Even old tapes, if well spliced, should be calibrated. Any tape that cannot be calibrated should be retired to work not demanding precision, and properly marked as such.




**CURVED LINES on the above chart show variations in tension corrections required for three different tapes. Calibration was determined by methods described in this article and available to any engineer.**

The field procedure for using the chart is simple and fast. First a rough taping of the distance should be made; for example, 170 ft. The estimated temperature is 30 deg., or 45 deg. colder than the "Invincible" calibration temperature. In the chart the temperature correction is 0.05 ft., and the tension is 56 lb. which is shouted to the helper. The tape is pulled at 56 lb. tension and the distance is then found to be 180.03 ft. The transitman then records 180.03 less 0.05 or 179.98 ft. in his field notebook.

The care taken in determining tape temperatures should be compatible with the accuracy desired. Shaft development surveys, especially on the surface where temperature variation is large, should warrant a tape thermometer fastened to the lower or shady side of the tape. Underground, where temperatures are more constant, a thermometer could be held against the tape just occasionally. For ordinary surveying where the desired *Limit of Error* is one in 5,000 or 10,000, the surveyor can get the temperature difference by guess and by feel after a few trial checks with a thermometer.

# Mining Industry Receives $8,238,936.27 from DMEA

LISTING OF MINERALS exploration contracts in force as of May 31, 1952 shows that the mining industry is getting substantial help from the taxpayer. Here is the list by states, including the name of the contractor, commodity involved, amount of government participation, and total value of the contract. Difference between the two amounts is the company's share of the estimated cost of the project. Utah got the biggest slice, $1,209,000.

| Name of Contractor | Commodity | Gov't Part. | Contract Value |
|---|---|---|---|
| **ALASKA** | | | |
| Zenda Gold Mining Co. | Tin Ore | $54,000.00 | $60,000.00 |
| Admiralty-Alaska Gold Mining Co. | Cobalt-Nickel | 108,000.00 | 120,000.00 |
| The Alaska Metals Mining Co. | Tungsten | 133,675.50 | 178,234.00 |
| Alaska Copper Corp. | Copper | 56,274.00 | 112,548.00 |
| **ARIZONA** | | | |
| Banner Mining Co. | Copper | 63,393.00 | 126,789.00 |
| Banner Mining Co. | Copper | 67,894.50 | 135,789.00 |
| Reed and Reed | Lead-Zinc | 10,000.00 | 20,000.00 |
| James P. Nash | Copper | 19,300.00 | 38,600.00 |
| American Asbestos Cement Corp. | Asbestos | 111,482.10 | 123,869.00 |
| Eugene J. Meyer | Copper | 2,095.00 | 4,190.00 |
| Sherwood B. Owens | Lead-Zinc-Copper | 31,963.00 | 63,926.00 |
| Yucca Mining & Milling Co. | Copper | 34,948.00 | 69,896.00 |
| **ARKANSAS** | | | |
| Gold, Ashley J. & Gold, Joe | Antimony | 12,684.75 | 16,913.00 |
| Inland Mining Corp. | Manganese | 75,000.00 | 100,000.00 |
| **CALIFORNIA** | | | |
| Philip Carey Mfg. Co. | Asbestos | 71,550.00 | 79,500.00 |
| Northfield Mines, Inc. | Tungsten | 33,540.00 | 44,720.00 |
| Holmestake Mining Co. | Tungsten | 14,250.00 | 19,000.00 |
| Black Rock Mining Corp. | Tungsten | 89,250.00 | 119,000.00 |
| Cordero Mining Co. | Mercury Ore | 150,621.00 | 200,828.00 |
| Miller & Warnken | Tungsten | 45,000.00 | 60,000.00 |
| Black Rock Mining Corp. | Tungsten | 46,217.63 | 61,623.50 |
| Sierra Copper Co. | Copper | 8,306.50 | 16,613.00 |
| California Quicksilver Mines, Inc. | Mercury Ore | 29,580.00 | 39,440.00 |
| Tungstar Corp & Hanging Valley Tungsten Mines. | Tungsten | 52,500.00 | 70,000.00 |
| Glidden Co. | Lead-Zinc-Copper | 147,150.00 | 294,300.00 |
| Frederick Dumontier | Asbestos | 5,334.62 | 5,927.36 |
| Harry E. Briggs | Lead-Zinc | 8,650.00 | 17,300.00 |
| **COLORADO** | | | |
| Callahan Zinc-Lead Co. | Lead-Zinc | 60,000.00 | 120,000.00 |
| Lupton Mining Co. | Lead-Zinc | 20,000.00 | 40,000.00 |
| Lead Carbonate Mines, Inc. | Lead-Zinc | 17,500.00 | 35,000.00 |
| Landauer, Frank | Lead-Zinc-Copper | 7,750.00 | 15,500.00 |
| Silver Bay Mines, Inc. | Lead-Zinc | 10,750.00 | 21,500.00 |
| Shelby-Johnson Mines, Inc. | Lead-Zinc | 4,900.00 | 9,800.00 |
| U. S. Oil & Development Corp. | Lead-Zinc-Copper | 23,825.00 | 47,650.00 |
| Cadwell Mining Co. | Lead-Zinc | 44,961.00 | 89,922.00 |
| Boulder Tungsten Mines, Inc. | Tungsten | 20,868.75 | 27,825.00 |
| Smith, John A. & Smith, Ben A. | Lead-Zinc | 12,500.00 | 25,000.00 |
| East Ridge Co. | Lead-Zinc-Copper | 30,090.00 | 60,180.00 |
| Beardsley, Geo. L. & Arthur B. | Lead-Zinc | 7,407.50 | 14,815.00 |
| Eureka Tungsten | Tungsten | 15,000.00 | 20,000.00 |
| Cold Spring Tungsten, Inc. | Tungsten | 158,310.00 | 211,080.00 |
| Cherokee Mines | Uranium | 21,600.00 | 24,000.00 |
| Stanford, Tom C. | Tungsten | 16,687.50 | 22,250.00 |
| Moreno-Cripple Creek Corp. | Lead-Zinc-Copper | 38,000.00 | 76,000.00 |
| Bachelor Development Co. | Lead-Zinc | 36,251.50 | 72,503.00 |
| Tungsten Mining Co., Inc. | Tungsten | 7,500.00 | 10,000.00 |
| United Mining & Leasing Corp. | Lead-Zinc | 10,000.00 | 20,000.00 |
| Treasure Mountain Gold Mining Co. | Lead-Zinc | 37,600.00 | 75,200.00 |
| Curtis C. Johnson | Tungsten | 3,750.00 | 5,000.00 |
| Henry E. Kolego | Lead-Zinc-Copper | 7,300.00 | 14,600.00 |
| The Realty Co. | Uranium | 72,000.00 | 80,000.00 |
| Callahan Zinc-Lead Co., Inc. | Lead-Zinc | $15,305.00 | $ 30,610.00 |
| Arthur N. Sweet | Lead-Zinc | 22,362.50 | 44,725.00 |
| Leadville Lead Corp. | Lead-Zinc | 50,400.00 | 100,800.00 |
| Jos. M. Smith, Chas. R. Rugg | Tungsten | 18,300.00 | 24,400.00 |
| Montana Mining Development Co. | Lead-Zinc | 7,500.00 | 15,000.00 |
| Uranium Co. of America | Uranium | 22,500.00 | 25,000.00 |
| John Joyce | Lead-Zinc | 11,850.00 | 23,700.00 |
| Brown, M. F., Eccker, A. F., Munro, Roy | Tungsten | 10,125.00 | 13,500.00 |
| U. S. Oil & Development Corp. | Lead-Zinc | 19,300.00 | 38,600.00 |
| Stanley Larson | Tungsten | 13,500.00 | 18,000.00 |
| Lottie M. Loveless | Copper | 1,500.00 | 3,000.00 |
| **FLORIDA** | | | |
| National Lead Co. | Rutile | 42,449.50 | 31,837.42 |
| **GEORGIA** | | | |
| Georgia-Carolina Mica Mining Co., Inc. | Beryl-mica | 2,353.00 | 2,614.00 |
| Arthur T. Anderson | Mica | 4,959.00 | 5,510.00 |
| Hale-Georgia Minerals Corp. | Manganese | 21,871.50 | 29,162.00 |
| **IDAHO** | | | |
| United Minerals Reserve Corp. | Lead-Zinc | 52,000.00 | 104,000.00 |
| Hermada Mining Company | Antimony | 33,075.00 | 44,100.00 |
| Day Mines, Inc. | Lead-Zinc-Copper | 144,000.00 | 288,000.00 |
| Bradley Mining Co. | Tungsten | 65,145.00 | 86,860.00 |
| Paymaster, Inc. | Lead-Zinc | 21,500.00 | 43,000.00 |
| Highland-Surprise Consolidated Mining Co. | Lead-Zinc | 100,000.00 | 200,000.00 |
| Holtermans, Johan P. | Fluorspar | 3,896.50 | 7,793.00 |
| Idaho Mining Co. | Lead-Zinc-Copper | 61,869.00 | 123,738.00 |
| Bleazard, J. W. & G. S. | Lead-Zinc | 4,200.00 | 8,400.00 |
| Rhode Island Mining Co. | Lead-Zinc | 11,950.00 | 23,900.00 |
| Sunset Minerals, Inc. | Lead-Zinc | 31,862.50 | 63,725.00 |
| Snoose Mining Co. | Lead-Zinc | 67,500.00 | 135,000.00 |
| Hope Silver-Lead Mines, Inc. | Lead-Zinc | 18,000.00 | 36,000.00 |
| McRae Tungsten Corp. | Tungsten | 15,263.25 | 20,351.00 |
| White, Compton I. | Copper | 28,655.00 | 57,310.00 |
| Svensson, Oscar V. | Antimony | 1,833.75 | 2,445.00 |
| Silver Star-Queens Mines, Inc. | Lead-Zinc | 66,918.50 | 133,837.00 |
| Sun Valley Lead-Silver Mines, Inc. | Lead-Zinc | 14,192.00 | 28,384.00 |
| Bradley Mining Co. | Antimony | 73,026.00 | 97,368.00 |
| Lawrence Berrett | Lead-Zinc-Copper | 2,500.00 | 5,000.00 |
| South Mountain Mining Co. | Lead-Zinc-Copper | 18,130.00 | 36,260.00 |
| Nabob Silver-Lead Co. | Lead-Zinc | 71,725.00 | 143,450.00 |
| Whitedelph Mining & Development Co. | Lead-Zinc | 60,125.00 | 120,250.00 |
| Funnel & Majer Mining Co. | Lead-Zinc | 26,614.00 | 53,228.00 |
| Gardner & Vance | Lead-Zinc | 7,000.00 | 14,000.00 |
| Louis Buchman, L. S. Breckon, J. A. Norden | Lead | 26,925.00 | 53,850.00 |
| Buckskin Mines, Inc. | Lead-Zinc | 6,100.00 | 12,200.00 |
| Donald D. Hanni | Lead-Zinc-Copper | 17,000.00 | 34,000.00 |
| Elmer Enderlin | Zinc | 4,560.00 | 9,120.00 |
| Chief Joseph Mines, Inc. | Tungsten | 5,580.00 | 7,440.00 |
| **ILLINOIS** | | | |
| Ozark-Mahoning Co. | Fluorspar | 30,982.50 | 61,965.00 |
| **IOWA** | | | |
| J. E. & Lula M. Miller | Lead-Zinc | 14,850.00 | 29,700.00 |

# IN MINING

| Name of Contractor | Commodity | Gov't Part. | Contract Value |
|---|---|---|---|
| **MAINE** | | | |
| Beryllium Development, Inc. | Beryl | $40,140.00 | $44,600.00 |
| **MICHIGAN** | | | |
| Calumet & Hecla Consolidated Copper Co. | Copper | 284,096.50 | 568,193.00 |
| **MISSOURI** | | | |
| National Lead Co. | Cobalt-Nickel | 274,078.27 | 391,540.39 |
| Shelton Mining Co. | Lead-Zinc | 7,000.00 | 14,000.00 |
| American Zinc, Lead & Smelting Co. | Lead-Zinc | 32,500.00 | 65,000.00 |
| Amedee A. Peugnet | Lead | 2,100.00 | 4,200.00 |
| **MONTANA** | | | |
| Mulcahy, William | Lead-Zinc | 2,546.15 | 5,092.30 |
| J. E. Hall | Copper | 10,642.50 | 21,285.00 |
| Columbia Mining Co., Inc. | Copper | 12,158.90 | 24,317.80 |
| Lewis B. Stark | Lead-Zinc | 25,000.00 | 50,000.00 |
| Cole, John W. | Tungsten | 52,500.00 | 70,000.00 |
| Key, Roy W. & Durand, O. J. | Lead-Zinc | 33,250.00 | 66,500.00 |
| Dance, Albert and Jewell | Lead-Zinc | 8,970.00 | 17,940.00 |
| Elkhorn Mining Co. | Uranium | 11,520.00 | 12,800.00 |
| Linton Mines | Lead-Zinc | 26,270.00 | 52,540.00 |
| American Alloy Metals, Inc. | Tungsten | 42,438.00 | 56,584.00 |
| Alberta K. Romerio | Lead-Zinc | 10,600.00 | 21,200.00 |
| Edmund E. Pohl | Lead-Zinc-Copper | 6,295.00 | 12,950.00 |
| D. A. McNabb | Uranium | 20,616.30 | 22,907.00 |
| Castle Lead & Zinc Co. | Lead-Zinc | 49,925.00 | 99,850.00 |
| Kootenay Copper Mines | Copper | 15,950.00 | 31,900.00 |
| Amador Mining Co. | Copper | 36,095.00 | 72,190.00 |
| Taylor-Knapp Co | Manganese | 68,250.00 | 91,000.00 |
| Alps Mining & Milling Co. | Tungsten | 22,396.50 | 29,862.00 |
| Florence Company | Lead-Zinc-Copper | 20,690.00 | 41,380.00 |
| Bennett Mining Co. | Lead-Zinc | 50,000.00 | 100,000.00 |
| American Alloy Metals, Inc. | Tungsten | 24,967.50 | 33,290.00 |
| Ambassador Mines Corp. | Lead-Zinc | 11,524.50 | 23,049.00 |
| McLure, William R. | Tungsten | 12,286.50 | 16,382.00 |
| Elkhorn Mining Co. | Uranium | 23,125.50 | 25,695.00 |
| Hughesville Silver & Lead Mining Co. | Lead-Zinc | 5,000.00 | 10,000.00 |
| American Alloys Metals, Inc. | Tungsten | 16,495.35 | 21,993.80 |
| Pittsburg Silver Mining Co | Lead-Zinc-Copper | 5,585.00 | 11,170.00 |
| Taylor-Knapp Co. | Manganese | 37,201.50 | 49,602.01 |
| Elkhorn Mining Co. | Thorium | 9,193.50 | 10,215.00 |
| Glenn Zorn and C. E. Vanman | Lead-Zinc | 11,200.00 | 22,400.00 |
| Minerals Engineering Company | Tungsten | 83,460.00 | 111,280.00 |
| David Nieminen, A. H. Eiselein & Maurice Nelligan | Uranium | 13,599.00 | 15,110.00 |
| Commonwealth Lead Mining Co. | Lead-Zinc | 25,290.00 | 50,580.00 |
| Madisonian Mining & Milling Co. | Asbestos | 21,960.00 | 24,400.00 |
| White Pinehead Co. | Lead-Zinc | 14,350.00 | 28,700.00 |
| James Young, Angus A. McDonald | Lead | 1,500.00 | 3,000.00 |
| West Slope Mining Co. | Tungsten | 7,560.00 | 10,080.00 |
| **NEVADA** | | | |
| United Minerals Reserve Corp. | Lead-Zinc | 26,750.00 | 53,500.00 |
| Bristol Silver Mines | Lead-Zinc | 90,814.00 | 181,628.00 |
| Madison, J. A. | Tungsten | 9,000.00 | 12,000.00 |
| Cherry Creek Tungsten Mining Co. | Tungsten | 56,250.00 | 75,000.00 |
| Baker, S. G. & Lovestedt, A. J. | Tungsten | 2,141.25 | 2,855.00 |
| Marshall Mining Co. | Copper | 25,210.68 | 50,421.37 |
| Hamilton Consolidated Mines | Lead-Zinc | 13,370.00 | 26,740.00 |
| E. S. Perry & Robert McPherson | Antimony | 1,980.00 | 2,640.00 |
| Grand Deposit Mining Co. | Lead-Zinc-Copper | 13,200.00 | 26,400.00 |
| Dunnigan, W. F. | Mercury Ore | 6,693.75 | 8,925.00 |
| Pennsylvania Mine | Lincoln | 12,896.11 | 25,792.22 |
| Mt. Wheeler Mines, Inc. | Tungsten | 56,607.00 | 75,476.00 |
| Baltimore Camas Mines, Inc. | Tungsten | 15,210.00 | 20,080.00 |
| **NEW HAMPSHIRE** | | | |
| Richard N. Berry | Mica | 11,700.00 | 13,000.00 |
| Stafford Mines, Inc. | Beryl-Mica | 5,760.00 | 6,400.00 |

| Name of Contractor | Commodity | Gov't Part. | Contract Value |
|---|---|---|---|
| **NEW MEXICO** | | | |
| Peru Mining Co. | Lead-Zinc-Copper | $112,500.00 | $225,000.00 |
| Black Hawk Consolidated Mines | Cobalt-Uranium | 18,000.00 | 20,000.00 |
| Chas. F. Williams | Copper | 83,700.50 | 167,401.00 |
| Clark & Mathis | Lead-Zinc | 6,327.00 | 12,654.00 |
| U. S. Smelting, Refining & Mining Co. | Lead-Zinc | 290,921.50 | 581,843.00 |
| **NORTH CAROLINA** | | | |
| Gaston Strategic Minerals Co., Inc. | Mica | 5,040.00 | 5,600.00 |
| Franklin Developers, Inc. | Mica | 3,240.00 | 3,600.00 |
| Mica Development Corp. | Mica | 5,400.00 | 6,000.00 |
| Powder Mill Mining Co. | Mica | 2,808.00 | 3,120.00 |
| W. H. Hipps | Mica | 2,610.00 | 2,900.00 |
| Lawrence Schmitt | Mica | 3,240.00 | 3,600.00 |
| Yancey Mica Mines, Inc. | Mica | 11,393.10 | 12,659.00 |
| The Hitchcock Corp. | Steatite Talc | 29,267.00 | 32,519.00 |
| Robinson, Henry Lee | Mica | 3,352.50 | 3,725.00 |
| Olivine Products Corp. | Cobalt-Nickel | 13,852.80 | 15,392.00 |
| Toe River Mining Co. | Mica | 4,050.00 | 4,500.00 |
| Fred Anowood | Mica | 5,760.00 | 6,400.00 |
| Piedmont Miners | Mica | 11,160.00 | 12,400.00 |
| Non-Metallic Minerals Corp. | Mica | 2,709.00 | 3,010.00 |
| Tamarack Mining Co. | Mica | 2,043.00 | 2,270.00 |
| C. C. Burleson | Mica | 2,389.50 | 2,655.00 |
| Flynt and Keller | Mica | 5,850.00 | 6,500.00 |
| Rex L. Boone | Mica | 3,600.00 | 4,000.00 |
| Bess Gaston Mica Miners | Mica | 6,210.00 | 6,900.00 |
| **OKLAHOMA** | | | |
| American Zinc, Lead & Smelting Co. | Lead-Zinc | 78,000.00 | 156,000.00 |
| **OREGON** | | | |
| E. E. Stauffer | Antimony | 26,045.25 | 34,727.00 |
| Waite Minerals, Inc. | Copper | 15,000.00 | 30,000.00 |
| **SOUTH DAKOTA** | | | |
| Keenan Properties | Tin Ore | 90,000.00 | 100,000.00 |
| Black Hills Keystone Corp. | Beryl-Mica | 20,772.00 | 23,080.00 |
| Michaud, Francis & Stratton, Louis | Beryl-Mica | 8,010.00 | 8,900.00 |
| Steward, Jack | Beryl-Mica | 14,192.00 | 15,769.00 |
| Carl L. Wiehe & B. A. Gira | Beryl-Mica | 6,017.40 | 6,686.00 |
| R. H. McHenry | Columbium-Tantalum | 3,184.20 | 3,538.00 |
| George Campbell and Glenn Ventling | Beryl-Mica | 5,895.00 | 6,550.00 |
| L. D. Pitts | Beryl-Mica | 5,373.00 | 5,970.00 |
| Belle Eldridge Gold Mines, Inc. | Lead-Zinc | 5,800.00 | 11,600.00 |
| **TEXAS** | | | |
| Maravillas Minerals Co. | Mercury Ore | 7,837.50 | 10,450.00 |
| **UTAH** | | | |
| Chief Consolidated Mining Co. | Lead-Zinc | 231,710.00 | 463,420.00 |
| New Mark Mining Co. | Lead-Zinc-Copper | 117,197.60 | 234,395.20 |
| Combined Metals Reduction Co. | Lead-Zinc | 111,000.00 | 222,000.00 |
| Combined Metals Reduction Co. | Lead-Zinc | 27,550.00 | 55,100.00 |
| Naildrive Mining Co. | Lead-Zinc | 20,000.00 | 40,000.00 |
| Park Utah Consolidated Mines Co. | Lead-Zinc | 48,633.00 | 97,266.00 |
| Privateer Mining Co. | Lead-Zinc | 4,031.00 | 8,062.00 |
| Park Utah Consolidated Mines Co. | Lead-Zinc | 21,000.00 | 42,000.00 |
| East Utah Mining Co. | Lead-Zinc-Copper | 54,587.00 | 109,174.00 |
| Harrington Mines Co. | Lead-Zinc | 62,620.00 | 125,240.00 |
| New Quincy Mining Co. | Lead-Zinc | 11,929.00 | 23,858.00 |
| Louise W. Ganick | Tungsten | 20,025.00 | 26,700.00 |
| Silver King Coalition Mining Co. | Lead-Zinc | 160,767.03 | 321,534.06 |
| Bowles-Heflin Mining Co. | Uranium | 17,049.60 | 18,944.00 |
| West Park Mining Co. | Copper | 8,100.00 | 16,200.00 |
| Canary Mining Co. | Copper | 24,052.50 | 26,725.00 |
| American Fork Consolidated Mines | Lead-Zinc | 8,019.00 | 16,038.00 |
| Woodman, Cecil R. | Tungsten | 9,284.25 | 12,379.00 |

| Name of Contractor | Commodity | Gov't Part. | Contract Value |
|---|---|---|---|
| Lakeside Monarch Mining Co. | Lead-Zinc | $5,000.00 | $10,000.00 |
| Heber Lion Mining Co. | Copper | 2,500.00 | 5,000.00 |
| Elkhorn Consolidated, Inc. | Lead-Zinc-Copper | 12,900.00 | 25,800.00 |
| Kentucky-Utah Mining Co. | Lead-Zinc-Copper | 17,500.00 | 35,000.00 |
| White Canyon Mining Co. | Uranium | 47,138.40 | 52,376.00 |
| J. R. Simplot Co. | Uranium | 64,340.48 | 71,489.42 |
| J. Walter Duncan, Jr. | Uranium | 38,871.00 | 43,190 |
| Excalibur Uranium Corp. | Uranium | 53,363.70 | 59,293.00 |
| Abe Day | Uranium | 9,810.00 | 10,900.00 |
| **VERMONT** | | | |
| Ruberoid Co. | Asbestos | 64,440.00 | 71,600.00 |
| Vermont Copper Co., Inc. | Copper | 25,691.00 | 51,382.00 |
| Ruberoid Co. | Asbestos | 56,250.00 | 62,500.00 |
| **WASHINGTON** | | | |
| Ole Aavestrus & Chas. J. Weller | Tungsten | 24,525.00 | 32,700.00 |
| Black Warrior Mining Co. | Lead-Zinc-Copper | 25,123.75 | 50,247.50 |
| Nasburg, Theodore | Lead-Zinc | 3,780.00 | 7,560.00 |
| American Zinc, Lead & Smelting Co. | Lead-Zinc | 60,000.00 | 120,000.00 |
| Goldfield Consolidated Mines Co. | Lead-Zinc | 11,527.50 | 23,055.00 |
| G. O. P. Antimony | Antimony | 17,400.00 | 23,200.00 |
| Talisman Mining & Leasing Co. | Lead-Zinc-Copper | 22,000.00 | 44,000.00 |
| Mines Management, Inc. | Lead-Zinc | $29,575.00 | $59,050.00 |
| American Zinc, Lead & Smelting Co. | Lead-Zinc | 58,250.00 | 116,500.00 |
| C. O. Davis | Lead | 21,375.00 | 42,750.00 |
| S. J. Holden & Assoc. | Copper | 3,800.00 | 7,600.00 |
| Addy Mining Co. | Tungsten | 15,967.50 | 21,290.00 |
| Hartbauer, C. W. & N. C. | Lead-Zinc | 5,000.00 | 10,000.00 |
| Tungsten Mining & Milling Co. | Tungsten | 25,987.50 | 34,650.00 |
| S. W. Zoldok | Lead-Zinc | 18,642.00 | 37,284.00 |
| Ray R. Whiting, Jr. | Mercury | 13,818.75 | 18,425.00 |
| G. O. P. Antimony | Antimony | 12,060.00 | 16,080.00 |
| **WISCONSIN** | | | |
| Dodgeville Mining Co. | Lead-Zinc | 4,020.00 | 8,040.00 |
| Scallon, E. P. | Lead-Zinc | 3,750.00 | 7,500.00 |
| Dodgeville Mining Co. | Lead-Zinc | 5,000.00 | 10,000.00 |
| Vinegar Hill Zinc Co. | Lead-Zinc | 15,996.66 | 45,704.75 |
| Calumet & Hecla Consolidated Copper Co. | Lead-Zinc | 79,259.00 | 158,518.00 |
| Star Mining Co. | Asbestos | 4,500.00 | 5,000.00 |
| Dodgeville Mining Co. | Lead-Zinc | 3,750.00 | 7,500.00 |
| Dodgeville Mining Co. | Lead-Zinc | 3,750.00 | 7,500.00 |
| Dodgeville Mining Co. | Lead-Zinc | 5,000.00 | 10,000.00 |
| Dodgeville Mining Co. | Lead-Zinc | 3,000.00 | 6,000.00 |
| Vinegar Hill Zinc Co. | Lead-Zinc | 34,220.19 | 68,440.38 |
| D. H. & S. Mining Co. | Lead-Zinc | 5,000.00 | 10,000.00 |
| **WYOMING** | | | |
| Porter, Kenneth L. | Sulphur | 49,575.00 | 99,150.00 |

## Radio Communication Improves Santa Rita's Operations

KENNECOTT COPPER CORP.'S huge open-pit mine at Santa Rita, N. M., now has 21 two-way FM radio sets in operation. The sets are proving of great value in sending information to various points in the pit, in reporting accidents promptly and in speeding repairmen and spare parts wherever there is a breakdown.

One stationary set is installed in the control tower, ten mobile units in trucks; eight in electric locomotives, and one in a mobile crane. The ten mobile truck units are assigned to pit foreman, the sample department, the track department, the general foreman, chief electrician, pit superintendent, powder foreman, and the electrical trouble shooter.

An operator licensed by the Federal Communications Commission is in charge of the approved operation of the industrial station. Then each operator of the base station is licensed under the Federal Communications Act. Companies who want to operate short wave radio stations for industrial purposes must get permission from the FCC.

## Anaconda Stockholders Approve Pension Plan

AT THE STOCKHOLDERS MEETING of the Anaconda Copper Mining Co., on May 21, 1952, C. F. Kelley, chairman of the board, Robert E. Dwyer, executive vice president of the company, and E. Roland Harriman, banker and railroad man, were re-elected to the board of directors for the ensuing three years. Represented in person and by proxy were nearly 6-million shares, and stockholders who approved the establishment of a pension plan for day's-pay employees of the company and its consolidated subsidiaries having domestic operations. The company had 118,616 stockholders on record at the end of last year. C. F. Kelley gave a talk on the postwar construction and improvement program of the company entailing an expenditure of nearly $300-million deriving his text from a beautifully illustrated booklet entitled "Anaconda Is Building," which was distributed to all stockholders after the meeting and which is available to the public, at the offices of the company, Butte, Mont., or 25 Broadway, New York City. E. S. McGlone, Butte, vice president in charge of western operations, opened the meeting, Mr. Kelley acted as chairman, and C. E. Moran, New York, secretary-treasurer of the company, acted as secretary at the meeting.

## Safety Awards Announced

J. J. FORBES, Director of the Bureau of Mines, announced the award of the "Sentinel of Safety" trophies for the best safety records during 1951. Winners in the metallic and nonmetallic fields were:

**Underground metal mines:** Soudan underground mine of the Oliver Iron Mining Division of the United States Steel Co. at Soudan, St. Louis County, Minn., for working 501,530 man-hours without a lost-time injury.

**Underground nonmetal mines:** Retsof mine of the International Salt Co., Inc., at Retsof, Livingston County, N. Y., for working 561,198 man-hours without a lost-time injury.

**Open-pit mines:** Mountain Iron open-pit mine of the Oliver Iron Mining Division of the United States Steel Co. at Mountain Iron, St. Louis County, Minn., for working 789,644 man-hours without a lost-time injury.

**Stone quarries:** Port Island quarry of the Inland Lime and Stone Co. at Gulliver, Mackinac County, Mich., for working 808,389 man-hours without a lost-time injury.

## Strike Threatens Tungsten Supply

AT LEAST A QUARTER of the nation's tungsten supply could be cut off unless the strike of miners at the Mill City tungsten mine of the Nevada-Massachusetts Mining Co. near Winnemucca, Nev., is settled intelligently. This is the interpretation of the situation expressed in a letter sent late in June (June 23) to California Senators William F. Knowland and Richard M. Nixon over the signature of P. R. Bradley, Jr. Bradley is chairman of California's state mining board, chairman of the San Francisco Chamber of Commerce mining committee, and president of Pacific Mining Co.

**Here's the background:** At the Mill City mine, third largest domestic producer of tungsten, the International Union of Mine, Mill and Smelter Workers demand a wage boost from $1.43 to $1.83 an hour. Management agreed to meet a wage scale which would be approved and recommended by the Wage Stabilization Board.

The Board recommended $1.65 an hour, and this was agreeable to the

managers, but the union appealed it. The appeal board concurred with WSB and the full WSB confirmed the panel's decision.

In an almost exact reversal of the steel situation, on June 16 the tungsten miners struck in protest against the ruling. Bradley says he was shocked to learn that a Conciliation Service mediator who conferred with both sides advised them that if they would it affect the short supply of could obtain approval by WSB. Although the employer would agree, WSB has advised him it will not change the original ruling.

While the Mill City mine could keep operating even if it paid $1.75 an hour, Bradley predicted that it would lead to widespread demands in the West for a higher scale that would shut down "fringe" producers. Not only would it affect the short supply of tungsten, but might eventually affect copper, lead, and zinc production from California to Idaho. Two other Nevada tungsten mines — Getchell, fourth largest domestic producer; and Nevada Scheelite, fifth largest—aren't parties to the immediate dispute, but Bradley thinks a higher pay scale would close both of them.

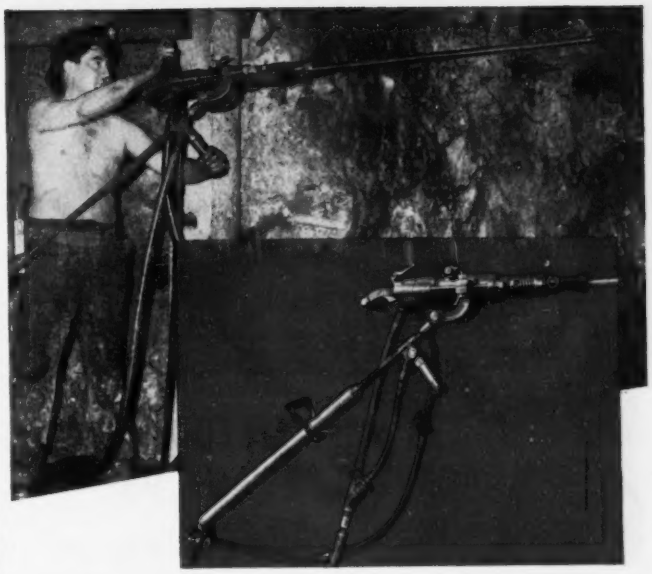
Looking at the whole picture, Bradley figures that since California and Nevada account for more than half the domestic production, and U. S. production is about half our total requirements, that at least a quarter of the tungsten supply could be cut off. In setting higher wage patterns, he recommended consideration of the full implications, including the fact that 95% of the domestic production comes from half a dozen mines, and that all but one of these are in California or Nevada. If the marginal producers were shut down, ore defenses would become almost totally dependent on imports, which now come from Portugal, Africa, and South America, but which could be cut off by either military or political action in a war.

## Sulphur Emergency Ends, Head of Freeport Says

THE SULPHUR EMERGENCY has ended, according to Langbourne M. Williams, president of Freeport Sulphur Co. The needs of nearly all consumers in this country are being met and the outlook for the future of the industry is "extremely encouraging."

About 100 new projects are expected to add 4-million long tons to the free world supply by the end of 1955, a study made by Freeport indicates. This is equivalent to a third of the estimated 1951 free world production of 12-million tons of sulphur.

The large gap between sulphur supply and demand no longer exists, Mr. Williams said. Although sulphur is still under government control, all but a few consumers in this country are getting all of the element that they need. The situation abroad also has improved. (*Continued on next page*)

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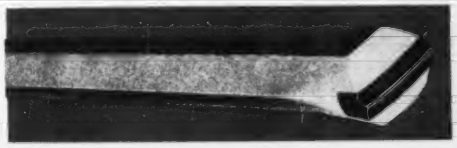

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**Indications are** that this compact, effective unit will provide a more efficient, lower cost answer to metal mining dewatering problems. Already, one ore processor is planning to move –⅛" ore directly from an Eliptex Dewaterizer to mill ore bins with only 12% to 15% surface moisture.

**Additional savings** are forecast for the *recovery* of these tailings. In all likelihood the Eliptex Dewaterizer will be able to save a high percentage of tailings now discarded due to present-day recovery difficulties.

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New projects are expected to add 1.5-million tons of sulphur in various forms to the capacity of the free world by the end of 1952; 1.35-million tons more by the end of 1953; 250,000 tons more by the end of 1954; and 900,000 tons more by the end of 1955.

Freeport's domestic price limited by OPS, continues at $22 a long ton, f.o.b. mine. The company's export price is $26.50, f.o.b. mine.

Substantially higher prices have been fixed by OPS on new high-cost operations to encourage production.

During the height of the sulphur shortage, foreign producers, such as Japan, were able to get as much as $200 a ton. Increased supply and a reduced demand have dropped "premium" prices to around $94 a ton.

## Expand on Synthetic Cryolite

THE ALUMINUM ORE CO., East St. Louis, Ill., has entered into an arrangement with the Defense Materials Procurement Agency to expand its facilities for producing synthetic cryolite by approximately 11,000 tons a year to help meet the needs of the aluminum program. Cryolite is used as a flux in reducing alumina to aluminum. Up to now the company has produced the product only for use of its parent concern, the Aluminum Company of America.

The agreement provides for the sale to the government of 42,600 tons of synthetic cryolite during the period 1952 through 1956 at a base price of 13.9¢ a lb. for 90% cryolite.

## Bolivia's Tin Program

VICTOR ANDRADE, Bolivian ambassador to the United States, on arriving in New York last week, revealed that his country is now selling tin concentrates to the RFC on a "spot basis."

Conclusion of a new agreement for the sale of tin concentrates to the United States "would be the first item on his calendar," he said. He asserted that nationalization of the tin mines will take place in an orderly manner with fair and just compensation to the owners.

The committee named to report on the tin program is expected to complete its findings by the end of September and report to the government.

## To Reopen Flooded Copper Mine

CALUMET & HECLA Consolidated Copper Co. will spend $6-million to reopen its flooded Osceola mines, in Houghton County, Mich., under a deal with the Defense Materials Procurement Agency. The government has agreed to purchase 53,000 tons of copper from the mines' output by mid-1962, and has guaranteed a floor price of 25¼¢. Production is to be at the rate of 7,125 tons a year.

# IN THE UNITED STATES

## ALASKA

★**Alcoa Mining Co.** has agreed with Hams Brothers of Sacramento, and Guntert and Zimmerman of Stockton, Calif., to ship 25,000 tons before Nov. 1 from its 30 patented claims at Edna Bay. Each year from now on 50,000 tons will be shipped to Portland and other points as needed.

★**United States Tin Corp.,** holding several hundred acres of patented claims at Lost River, expected to start its 100-ton mill early this summer. Daily output will be about 2 tons of concentrates containing about 65% metal. Estimated reserves come to about 4,151,000 tons of ore containing 28-million lb. of tin and 5-million lb. of tungsten.

★**Harry Townsend** has been at Chisana and Slana investigating a lead-zinc-gold property for St. Joseph Lead Co.

## ARIZONA

★**Arizona mines are fighting** an initiative measure which would impose an additional severance tax on mine production in the state.

The proposed tax would amount to 1% of the gross proceeds of sales or gross income. Payments are required monthly with a 20% penalty for delinquency, plus interest at 7% annually until paid.

Labled as a measure to reimburse the state for depletion of natural resources, the real objective, mining factions say, is to provide funds for public employees retirement.

Mining interests claim that deception is being used to obtain signatures to put the petition on the ballot. Three petitions, each with a sheet for signatures, are stapled together. The first is an act to activate a public employees retirement fund and making an appropriation; next is the one imposing an excise tax on persons engaged in mining; the third is a proposal amending the constitution to establish a civil service system and state department of personnel.

Mining men claim that while the first proposal sounds all right, signers frequently do not read the second and third—and may not be aware there are three distinct proposals.

Small mine owners throughout Arizona claim the industry already is taxed at a higher rate than mines in other states. Arizona mining pays the regular sales tax on state purchases, and in addition pays a 1% production or severance tax on all metals and minerals produced.

The only other industries which pay a production tax are slaughterers and meat processors who pay at the rate of 0.25, and newspapers and printing contractors who pay 1%.

Miners claim assessment of an additional 1% would be discrimination.

★**Sale of the Regal Asbestos mine** in Salt River Canyon northeast of Globe has been made to the Jaquays Mining Co., owned by D. W. Jaquays, Phoenix. The former owner was Arizona Chrysotile Co. The company has been operating the mine with a work force of 20 men and also operates a cruding and fiberizing mill near Globe.

★**Arizona mine and quarry employment** showed a 7% gain during 1952, according to a report by the Employment Security Commission. In April, 1952, there were 12,500 persons employed in mine and quarry operations as compared with 11,700 the previous year and 11,400 in 1950. The entire increase was in copper mining. Average earnings in the mining industry in 1952, was $89.87 as compared with $80.70 and $71.90 for the two previous years.

★**To stimulate production of domestic manganese ore,** a depot has been established at Wenden, Ariz., to which miners and producers can ship such ore for purchase by the government, Jess Larson, administrator of General Services and of the Defense Materials Procurement Agency, announced today.

Ore delivered at the Wenden depot must contain a minimum of 15% of manganese to be acceptable under the regulation setting up the depot, and 5 long tons of ore is the least that will be accepted in a single shipment. Moreover, the ore will be purchased only from miners or producers who have notified the government in advance of their intention to take part in the program.

Prices to be paid for acceptable ore will be computed on the basis of $2.30 per long ton unit of recoverable manganese, less handling and treatment costs.

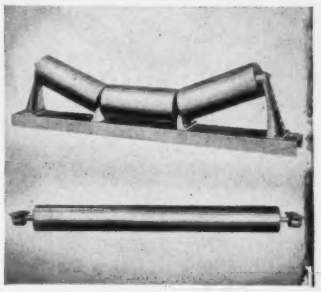
The actual amounts paid are determined by a number of conditions as set forth in the regulation establishing the depot, copies of which will be available shortly from the GSA Regional Office, Building 41, Denver Federal Center, Denver 1, Colo.

## CALIFORNIA

★**Preliminary work has begun** at the Siskon gold mine in the Dillon Creek region, 20 mi. north of Somes Bar, near Yreka. Erection of prefabricated buildings is proceeding and more than 30 men will be employed when actual mining begins. Property was recently leased from Hugh Wright of Happy Camp by H. B. Chessher, Reno. Ore is to be mined in open pits.

★**Agreements have been reached** with Bureau of Reclamation to open the western shore of Shasta Lake to copper mining operations as the result of dismissal of two damage actions against the U. S. Government.


HEWITT



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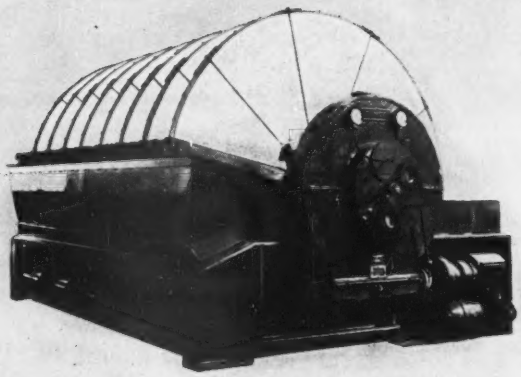

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## California *(Continued)*

One agreement calls for construction of an $860,000 8-mi. access road from Shasta Dam to the copper mining area near Square Creek, to become part of the Shasta County public road system.

The other covers the purchase by the bureau of 2,600 acres of property belonging to U. S. Smelting, Refining & Mining Co. for $70,000.

★**Preliminary work has begun at Antelope** copper mine 35 mi. southeast of Hollister, to install units for precipitation of metal from crushed ore. Property contains an orebody 50 ft. wide and has been developed by 500 ft. of tunnels. Crushed ore will be leached and copper precipitated with scrap iron in vats. A ball mill and concentrator will be installed to treat gold if future operations warrant. Some ore assays 40% copper, but most is relatively low grade. Property is owned by Arthur S. Pearce and Hollister associates.

★**Fred Anderson, San Francisco,** recently acquired lease and option on 17 zinc-lead claims at Fish Creek Wells, about 34 mi. southwest of Eureka, from Stanley Fine and R. C. Kelley. Preparations are now being made to build a 100-ton mill which will be in operation about December. Andy Jones is in charge of operations.

★**Inyo County's tungsten properties** have reported steady expansion within the last months. Union Carbide & Carbon and Black Rock mining companies are producing at capacity in the Bishop area. Tungsten-Hanging Valley Mining Co. is increasing operations at the Tungstar, west of Bishop. U. S. Tungsten Corp. is reported planning installation of a large concentrator at its leased property 14 mi. east of Independence. The Jumbo Tungsten-Gold property, on western slope of the Inyo Mountains, reports large deposits of commercial grade scheelite, which extends a distance about 1400 ft. between lime and granite and is estimated to be a possible 2000 ft. deep. Underground workings include 160-ft. incline shaft and 110-ft. tunnel. A $50,000 access road was recently completed to the property which is at 7,000-ft. elevation. Projected concentration plant would have a capacity of 200 tons of ore daily.

★**Shooting Star Tungsten Co.** has recently reactivated the old United Tungsten mine in Morongo mining district, San Bernardino County. Scheelite occurs in a contact zone between granitic country rock and marblized limestone. Mine was last operated in World War I with undetermined production and about 1000 ft. of workings.

★**Manganese ore** is now being mined and milled by the Blythe Manganese Co. about 30 mi. northwest of Blythe, Riverside County. Manganese oxide ore occurs both in well-defined veins and cementing fragments of country rock in shear zones. A 300 ft. tunnel has re-

cently be completed tapping bottom of the old Blackjack mine workings. Ore is treated at a recently constructed mill located on the Santa Fe Railroad at Inca Siding, 10 mi. east of the mine.

★**Recent development in the Morongo mining district,** San Bernardino County, is the Rattlesnake dolomite operation of W. E. Schmidt, Yucca Valley. Schmidt has been producing about 50 tons of dolomite roofing granules weekly. Massive white dolomite is quarried and hauled half a mile to the mill where it is crushed and screened to minus ⅝ in., plus 10 mesh. Two men are mining and two men operate the mill.

## COLORADO

★**Wesley Moulton** from Cripple Creek plans to work his lead and zinc mine, the Galena Queen, nine miles north of Silverton. Last year he shipped about 2,000 tons of ore averaging 8% lead and 16% zinc. It is hoped the output can be doubled this year. The shaft is down 145 feet.

★**Gross value of ore treated** during April at the Carlton Mill at Cripple Creek was approximately $177,000. Monthly ore receipts totaled 13,048 tons; average value, about $13.50 a ton. This total was achieved in spite of a four-day shutdown for lack of water. Daily tonnage remains near the 600 ton mark, with slightly more dump rock than newly mined ore being treated.

★**Silver Bell Mines Co.** at Ophir is running a new float section in the mill to remove zinc from the Carbonero ore. After a 10-week shutdown, the road to the Carbonero closed by the heavy snows and slides which took out the power line was opened.

★**Drilling crews on the 31st and bottom level** of the Ajax at Cripple Creek have blasted into the Bobtail vein, according to C. H. Carlton, mine manager. Grabs from the 3 ft. vein have been assaying from $7 to $10 in gold per ton. During the month of April, the gross tonnage shipped from the Ajax was $46.62.

★**Receipts of gold** at the Denver mint for May came to 62,327 oz. worth $2,181,441 compared with 52,687 oz. worth $1,844,061 in May, 1951. Silver receipts amounted to 155,036 oz. worth $140,250 compared with 14,418 oz. worth $13,043 in May, 1951. Number of deposits was up to 277 from 132.

★**William C. Russell, Jr.** leased the American Flag mine on Quartz Hill to a Denver group, which plans considerable exploration work during the summer. The mine was a rich producer in the early days, but has been idle for a number of years.

★**Front Range Mines, Inc.** operators of the Strong mine in the Cripple Creek District and also a block of ground in the Golden Cycle's adjoining Ajax mine, have shipped a total of $124,213 gross since the first of the year. The ore averaged about $75 in gold per ton.

★**A new shaft** has been started on the north end of the Strong group by the Gold Coin Mining & Leasing Co. at Cripple Creek.

★**Ore from the Caledonia mine** near Silverton is being shipped to the American Zinc Lead Co. mill at Ouray. This company has Caledonia under lease.

★**The realty company** owning the old Calhoun mines on Quartz Hill, Gilpin County, will cut the Wood vein 600 ft. from surface.

★**W. G. Sandell,** superintendent at the Old Hundred mine in Cunningham gulch near Silverton, says the company is shipping around 300 tons of good grade ore per week to the Shenandoah-Dives custom mill. Twenty men are employed.

★**Miners say Kokomo will boom again.** The road has been opened to the Queen of the West mine for large ore trucks and heavy equipment. Some work was done during the winter and now operations and shipping of ore can proceed.

★**The report of Camp Bird, Ltd.** says the Camp Bird mine at Ouray, last year showed an improvement from £13,000 to £19,000 in the income received from this source, constituting a 25-year record.

★**At the Carlton Mill** the best weekly gold pouring to date was made early in June with four brick readied worth $117,700. The best previous pouring was early in May with three large bars worth $93,000. The mill has now poured 50 gold bars since operations began about fourteen months ago.

★**A rich shipment of ore** was settled for recently at the Carlton mill for the Forest Queen mine, according to Francis Gunn, superintendent for Champion Mines, Inc., operator. The lot of high grade consisted of 31,000 lb. and was worth $154.75 a ton. Gross value was $1,291.08.

★**A new flotation machine** and other equipment arrived in Silverton for San Juan County's newest mill. The equipment was for the Venture Leasing Co.'s steel and concrete mill, which will be located in Mastodon Gulch.

★**More than 60 claims** reported rich in thorium in the St. Peter's Dome area between Cripple Creek and Colorado Springs have been filed for in the El Paso County courthouse.

★**The Rico Argentine** moved a portable compressor up to the Saint Louis tunnel where they have started to muck out the cave near the portal. The company plans on cleaning out the 6000-ft. main tunnel, then driving several hundred feet south to cut the ore beds under the old Argentine shaft.

★**Robush Brothers** have started operations underground at the Henry Adney mine just down the gulch from El Paso mine on Beacon Hill at Cripple


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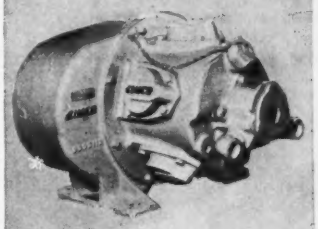

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## Colorado *(Continued)*

Creek. About 150 ft. of the first 700 ft. of the shaft will have to be repaired. The first work on the third level will be a drive to cut the big El Paso phonolite dyke.

★**United States Gold Committee, Inc.** with offices at 905 American Bldg., Washington 4, D. C., has been incorporated in Colorado and is working for the reestablishment of a solid dollar, based on a modern gold standard, at a realistic price of gold, of $75 or more, an ounce.

★**The St. John mine** at Montezuma is sinking a winze under the direction of Buck Oelrich, and the mine has started hauling ore to the Jeffrey mill in Montezuma.

★**In the Caribou mining district** in Boulder County, Pandora Metals, Inc. is at work and will push underground operations during the summer from the 450-ft. level. A boarding house is being constructed so that the company can carry on work through the winter months.

★**Four Corners Uranium Corp.,** a subsidiary of the Silver Bell Mines Co. at Telluride has started mining operations on uranium claims at Cisco, Utah, about 65 mi. west of Grand Junction. William N. Binder is in charge of operations, under the direction of A. A. Smith, superintendent of the Silver Bell.

## FLORIDA

★**Production of ilmenite** at the Starke, Fla., plant of the E. I. Du Pont de Nemours & Co. has been stepped up to between 8,400 and 8,500 tons per month. Along with this, zircon production is now running at between 1,500 and 1,600 tons per month.

In addition the company is now recovering staurolite, an aluminum silicate, to be sold to Lehigh Portland Cement Co. for use at its new plant near Bunnell. Heretofore, staurolite was part of the tailings from the ilmenite plant sent to zircon recovery dry mill and then to waste.

Ilmenite deposits now being worked are running at about 4% heavy mineral, with about 1.2% ilmenite recovered. Recovery of staurolite has added another commercial product to the operations. Plant capacity, now being installed, is about 80,000 tons per year. The company is installing five Carpco Engineering Corp. magnetic separators together with conveyors and other equipment.

Du Pont is doing a great deal of research and testing on the use of rubber-covered pumps, pipes and Humphrey spirals and has met with a great deal of success. Wear is considerably less than on steel equipment and maintenance costs have been greatly reduced.

## IDAHO

★**Directors of Polaris and Silver Summit Mining** companies have approved a proposal to consolidate the two companies into the Polaris company which now owns 64.36% of the outstanding Silver Summit stock. Under the proposed agreement, individual holders of Silver Summit shares would receive one share of Polaris stock for each three shares of Summit stock now held.

★**Eastern Lead Corp.** has encountered good ore showings in the course of surface exploration work on its property in the Hunter mining district east of Mullan. Bulldozer trenching and stripping has exposed the vein for about 60 ft. along its strike. Ore occurs in the strong shear zone, designated as the Deadman's Gulch shearing.

★**Another big exploration** and development project has been started in the east end of the Coeur d'Alene mining region. Sullivan Mining Co. has commenced surface trenching and stripping to expose geological structures and permit a thorough mapping and geological survey of the 500-acre area. Under the development agreement concluded between the Sullivan and Silver Mountain firms, the operating com-

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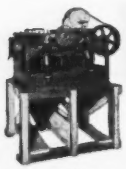
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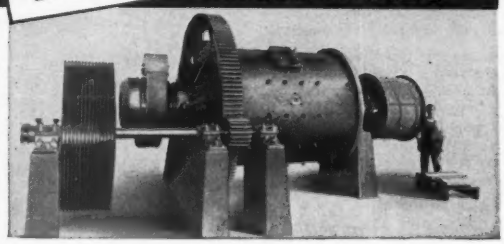

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pany is allowed one year for this type of reconnaissance before starting underground work.

★**A new corporation, Big Pay Day Mining Co.** has been organized at Sandpoint, Idaho, to develop the old Spirit of Idaho property in Boundary County near the Canadian border. Sven Anderson, veteran miner, prospector and leaser, is head of the new firm which has relocated the old World War I prospect. Old workings include a 110-ft. shaft sunk on a 3-ft. vein of zinc-lead ore.

★**Idaho Birthday Mines Co.** has completed 1700 ft. of advance in the new lower tunnel being driven to gain depth on a vein which produced a considerable tonnage of ore from surface operations at its Banner district property, Boise County. The new tunnel is expected to reach its objective within about 400 ft. A contract has been let to Glen E. Rushby & Sons of Mammoth, Utah, for 500 ft. of work to provide for some prospecting along the vein when it is reached. The company made 76 shipments of crude ore and concentrates from upper workings before starting the lower development.

★**R. S. McClintock,** Spokane mining contractor, has taken a contract to sink the inclined shaft at Whitedelf Mining and Development Co. near Clark Fork, from the 400 to the 800-ft. level. The shaft work is being undertaken as part of a $120,250 exploration project approved by DMPA.

★**Value of mine production** in the Coeur d'Alene district reached a record high of $59,663,980 in 1951, according to reports filed by 41 mining and leasing operations filed with the county assessor of Shoshone County. Tonnage of ore extracted was the second highest on record last year, totaling 1,960-892 tons. Only in 1942 was a greater tonnage mined. That year mine output was 2,243,797 tons. Bunker Hill was the district's largest operation both in tonnage and in value of production with an output of 626,143 tons valued at $14,322,445.

★**Hecla Mining Co.** has started deepening the Atlas shaft near Mullan from the 800 to 2400-ft. level after a year of preparation which included improving and enlarging over 9000 ft. of adit tunnel, cutting of a new hoist station and rope raise, and installation of a new 400-hp. electric hoist. The Atlas deep development project is a joint venture by Hecla, Newmont, and New Jersey Zinc with the Atlas retaining a 25% interest.

★**Idaho-Custer Mines, Inc.,** which started rehabilitating the old Livingston mine in Custer County last April, is stockpiling development ore pending completion of a 500-ton crushing plant. Since taking over the old producer in June, 1951, the company has fixed up and expanded the old mine camp, built a 200-ton flotation mill, and earned $125,000 milling old dump material.

★**Hecla Mining Co.** has acquired the old Amazon-Dixie and Golden Eagle groups of mining claims on the Idaho-Montana border east of Mullan.

★**National Silver-Lead Mining Co.** has resumed development on its property on the south side of the silver belt in the Coeur d'Alene district. Reopening of an old upper tunnel about 175 ft. above the main adit will be among the first jobs undertaken.

★**Nabob Silver-Lead Co.** has developed an orebody over 230 ft. long on the vein first encountered last March. The ore is described as high-grade zinc-lead with good silver content, and indications are that it can be mined across 3 to 5 ft. of width using the shrinkage-stoping.

★**Leasers have made two shipments** of tungsten ore from the Big It Mining and Milling Co. property on Trapper Creek in the Pine Creek area, since taking over its operation a year ago. The property is the only producer of tungsten in the Coeur d'Alene district.

★**Spokane-Idaho Mining** is now getting some production from the old Douglas mine which it took over under an operating agreement last November. Current output is from stopes in old upper working. It is being milled in the company's Constitution mill along with some dump ore. Unwatering of the 390-ft. inclined shaft and lower levels has been completed. The shaft will be deepened 200 ft. under terms of the agreement.

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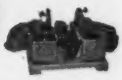
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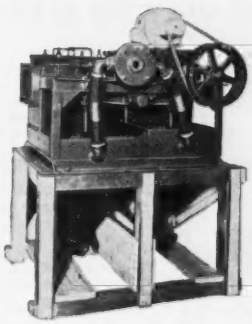

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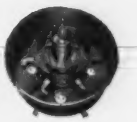
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## Idaho *(Continued)*

★**First shipment of ore** by Silver Star-Queens Mines, Inc., from its Minnie Moore-Queens operation in the Mineral Hill district of Blaine County netted the company $11,201. The shipment totaled 107 tons of crude ore from the 450-ft. level of the Queens vein in an area opened recently under a $133,837 DMEA contract. It assayed 33.6% lead, 11.4% zinc and 42.24 oz. silver per ton.

★**Shaft-deepening** at Federal Mining and Smelting Co.'s Morning mine at Mullen has been completed and a new level at 5200-ft. is being established.

★**Reduced metal prices** and rising costs have forced Sunset Minerals, Inc. to curtail operations substantially at its Pine Creek area property. Most development work and marginal stoping was suspended early in June when about one-third of the 50-man crew was laid off.

★**Discovery of important deposits** of acid grade fluorspar deposits on the Crystal Cluster and Broken Halter group of claims in the Primitive Area of the Salmon River canyon have been reported by A. P. Smothers of Shoup. Deposits are 20 mi. from the nearest forest service road.

★**B. W. Porter**, Seattle, president of Goldstone Mining Co., reports that the company has resumed operations at both the Goldstone and nearby War Eagle properties after a brief winter shutdown.

## KENTUCKY-ILLINOIS

★**Strikes at three of the major fluorspar plants** following expiration of union contracts May 31 and closing down of other plants because of reduced market demand resultant from the nation-wide steel strike halted production in the Illinois fluorspar district for several weeks.

Employees of Alcoa Mining Co., fluorspar division, and Minerva Oil Co., fluorspar division, have returned to work following wage agreements which grant an 11¢ per hour increase and a 5¢ and 8¢ shift differential. Alcoa has signed a new contract, subject to approval of the Wage Stabilization board. The new contract covers operation of Alcoa's Rosiclare plant and the Hudson mine in the Kentucky district.

Between 400 and 450 employees are affected by Alcoa's settlement, and 60 employees by Minerva Oil Co.'s settlement, which followed the same wage pattern.

Rosiclare Lead and Fluorspar Mining Co., whose 200 to 250 employees went out on strike, has suspended negotiations, pending settlement of the steel strike.

Agreement at Alcoa and Minerva followed the pattern of Ozark-Mahoning Co. No strike occurred at Mahoning.

Crystal Fluorspar Co. closed down, pending sale of its properties.

With no market demand for metallurgical fluorspar because of the steel strike, PMT mine and other small operations in the district have been shut down.

★**Ozark-Mahoning Co.** has begun sinking a new 700-ft. shaft on the Oxford tract, in Hardin County, with James W. Patton and Sons contracting the job.

## MICHIGAN

★**Zontelli Brothers, Inc.** have arranged with the city of Ironwood to obtain water from the Montreal River for their washing plant. The plant treats material that came from the sinking of the Pabst, Norrie and Aurora shafts nearly 60 years ago.

★**Pickands, Mather & Co.** will rebuild a portion of highway No. 424 in Gaastra in order to swing around Buck mine ore under the present road location which it plans to remove.

★**Until the strike,** Pickands, Mather & Co. was hastening work on the development of its Fortune Lake open pit mine. Briar Hill Creek has been diverted and the pit area has been brushed. About 4-million cu. yd. of overburden will be removed and some 1½-million tons of ore will be shipped during the next three or four years. After the open pit mining has been completed, the mine will become an underground operation. Estimated cost of the Fortune Lake mine development is about $3¾-million. The Fortune Lake will be the third open pit mine on the Menominee Range, the other two being small pits near Iron Mountain.

★**Pickands, Mather & Co.** is also active at the Lawrence mine southwest of Crystal Falls. The old Carpenter mine shaft is being repaired to provide access to the Lawrence and this work has now reached about 650 ft. A new surface plant consisting of engine house, shop and dry is to be built and a permanent headframe will be erected at the Carpenter shaft. The Lawrence is expected to be in operation by 1954.

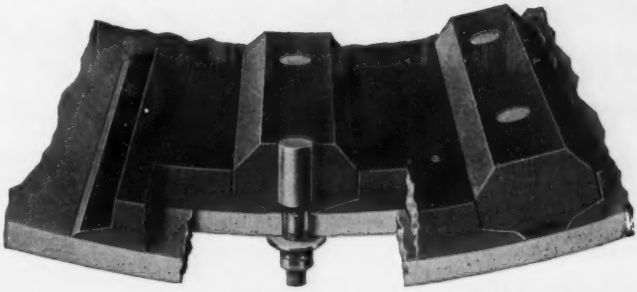
★**Temperature checks** made in underground mines in the Iron River district gave some interesting information. The Homer mine at 900 ft. was 60 deg.; the Wauseca at 1,000 ft. was 65 deg.; The Buck at 1500 ft., 60 deg.; the Davidson at 950 ft., 50 deg. (the coolest mine); the Sherwood at 1200 ft., 56 deg.; and the Spies at 900 ft., 65 deg. Copper mines, at the same levels, were warmer than the iron mines.

★**A drill has been set up** on a property known as the Ernest Hamel farm near Champion where the Jones & Laughlin Ore Co., with the Atomic Energy Commission under a joint agreement, will explore for uranium.


*When you install*

**U·S·S LORAIN ROLLED PLATE LININGS**

*you save*



**Save on installation time and labor.** Lorain Liner Plates are made to accurate size and in easily-handled sections . . . can be installed quickly and easily.

**Save valuable grinding space.** Because of the strength and resistance to breakage of the rolled steel from which U·S·S Lorain Rolled Plate Linings are made, plates of reduced thickness can be used, thereby increasing the usable diameter of the mill . . . boosting output.

**Save on "time out" for repairs.** Close fits between ends of plates and between plates and lift bars of U·S·S Lorain Rolled Plate Linings eliminate shell wash and allied troubles which result eventually in costly mill repairs.

**Save on replacement materials.** Lorain Liner Plates are so rugged they'll wear 'til they're paper thin without failing! And because the plates are interchangeable, severe localized wear at feed or discharge ends of the mill may be balanced just by reversing the worn plates to the opposite end. You get the full life of your linings when they're U·S·S Lorain Rolled Plate Linings!

*There are U·S·S Lorain Rolled Plate Linings to fit any type of mill—for wet grinding or dry. Available through leading mill manufacturers whose names will be furnished upon request.*

**For uniform, efficient grinding action specify U·S·S GRINDING BALLS, too**

● For still lower grinding costs and higher grinding efficiency, specify U·S·S Grinding Balls for your mill. They're made to exacting specifications . . . are carefully tested from raw materials to finished product to assure surface hardness and maximum hardness penetration. Available in diameters from ¾" to 5". For further information send for our free booklet on U·S·S Grinding Balls.

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Without obligation on my part, please send me your FREE booklet on U·S·S Grinding Balls.

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**U·S·S LORAIN ROLLED PLATE LININGS AND U·S·S GRINDING BALLS**

2-462

UNITED STATES STEEL

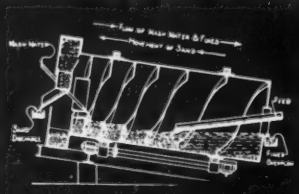
# HARDINGE MILLING EQUIPMENT

## SEPARATORS

HARDINGE HEAVY-MEDIA SEPARATORS have only one moving part, are very efficient and will start up fully loaded. Tramp material will do no harm. Bulletin 39-B-1.

## CLASSIFIERS

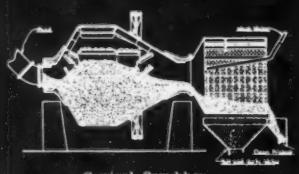
HARDINGE COUNTER-CURRENT CLASSIFIER is used for making size separations of ores and sands. It consists of a slowly rotating drum, on the inner surface of which is attached a screw flight. The coarse material is separated from the fines through the action of gravity. Bulletin 39-B-1.



Separator and Classifier

## SCRUBBERS

THE HARDINGE CONICAL SCRUBBER cleans by mass contact and natural displacement. This action removes dirt and silt without wear on the scrubber. The classifying action of the cone holds back the large clay balls until properly disintegrated. Bulletin 37-A-1.



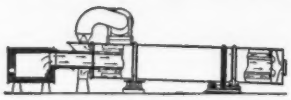
Conical Scrubber

## DRYERS

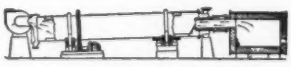
RUGGLES-COLES HORIZONTAL ROTARY DRYERS are built in distinct types of double and single-shell Rotary Dryers, designed for direct, indirect and steam heat. Bulletin 16-D-1.

CLASS XA — This Ruggles-Coles double-shell, direct-heat Dryer has the highest thermal efficiency, and consequently the lowest fuel consumption, of any rotary dryer manufactured.

CLASS XH is a single-shell, parallel-flow dryer, especially designed to handle flotation concentrates without sticking and without excessive dust loss. It has a high thermal efficiency and dries any stocky organic or inorganic material quite economically.



Class XA Rotary Dryer



Class XH Rotary Dryer

HARDINGE COMPANY, INCORPORATED

YORK, PENNSYLVANIA—240 Arch St. Main Office and Works

NEW YORK 17 • SAN FRANCISCO 11 • CHICAGO 6 • HIBBING, MINN. • TORONTO 1

122 E. 42nd St. 24 California St. 205 W. Wacker Dr. 2016 First Ave. 200 Bay St.


## Michigan *(Continued)*

★**Duluth, South Shore & Atlantic Ry. Co.** is constructing a 14-mi. branch line from Berglund, Michigan, to the White Pine mine of the Copper Range Co.

## MINNESOTA

★**Great Northern Railway Co.** has received more than one-half of the 700 new cars it has on order. The road now has about 8,000 iron ore cars in service. New diesel locomotives purchased, reduce time required for a round trip from mines to ore docks, with the effect of adding further new cars to its ore-carrying capacity.

★**The International Nickel Co.** is negotiating for options on the South Kawishiwi copper-nickel prospect—called the Childers-Whiteside property—about 12 mi. southeast of **Ely.** In addition to surface indications, one diamond drill hole has been put down which shows mineralization. A portion of the property is government land within the Superior National Forest.

★**New officers** of the Lake Superior Mines Safety Council, elected at the annual meeting in Duluth, are: Al Kolu, assistant safety supervisor for Pickands, Mather & Co., president; Robert F. Wilson, supervisor of safety with the Oliver Iron Mining Division, vice president; John A. Johnson, U. S. Bureau of Mines at Duluth, secretary; and E. W R. Butcher, chief mining engineer, Republic Steel Corp., treasurer.

★**Jones & Laughlin Minnesota Ore Division** began shipments this season from its Wentworth mine near Aurora, following a stripping program. Except for a shipment of 851 tons in 1915, this is the first season for the Wentworth as a producer. Estimated tonnage of the property is slightly more than 1-million tons.

★**Oliver Iron Mining Division's** King mine at Coleraine will be ready to begin ore shipments soon after the strike-bound mines resume work. The King has an estimated tonnage of 6,629,374 tons.

★**M. A. Hanna Co.'s** Enterprise mine, a new property at Virginia, began stripping before the strike. Ore will be shipped in 1952, if operations are not too long delayed The Enterprise has an estimated 5,068,000 tons.

★During the last full week of shipments before the strike, lake vessels hauled the largest tonnage for the 1952 season: 3,125,969 tons. This made the season total 19,623,508 tons compared to 19,455,928 tons in 1951.

★**Pickands, Mather & Co.** and the M. A. Hanna Co., together, shipped almost 30% of the total 1951 Lake Superior region production The Oliver Iron Mining Division furnished about 45% and the Cleveland Cliffs Iron Co.,

9½%. Twenty-four mining companies contributed to the 96,998,943 tons shipped, with Jones & Laughlin and Republic Steel Corp. in fifth and sixth places. The first six largest producers were in the same order as in 1950.

★**The new heavy density plant** for the Mesabi Chief mine of M. A. Hanna began operating on May 16 on a two-shift, seven-day-week basis. During the winter months the screening plant in the pit was moved to a new location. The crushed and screened ore is fed onto a 1370-ft. 36-in. belt which carries it up a 15-deg. incline to a 400-ton surge bin on surface, where merch ore is loaded into railroad cars and wash ore into dump cars for transportation to the washing plant.

★**A samplers' school** was held at the Cooley district mines by M. A. Hanna Co., this spring, both for those who had already worked as samplers and for new men. The instruction was under the direction of Sander Lawrence, vice president of Lerch Brothers.

## MONTANA

★**Lucky Lead Mines, Inc.,** newly incorporated in Montana, has taken over the Nonpareil group of patented claims in the Princeton mining district, near Philipsburg, and is planning to take over a number of other claims in the same district. The company is headed by Earl T. Ellis of Seattle.

★**Lexington Silver-Lead Mines, Inc.,** has resumed operations at its Big Seven property in the Neihard district, and expects to start its mill on mine dump ore in the near future. The company will apply for a government exploration loan, according to J. A. Allen, Spokane, president.

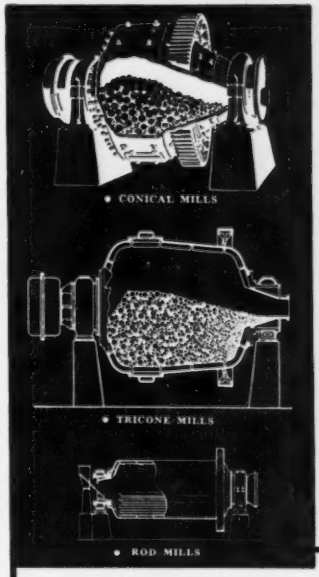
★**Coronado Copper & Zinc Co.** has offered to develop the properties of the Mineral King Mining Co. in the east Coeur d'Alene district, about 12 mi. east of Mullan, Idaho, near Saltese. The Mineral King properties consist of 32 unpatented mining claims, including the old Tarbox and Meadow Mountain groups, containing lead-silver ore.

★**American Chrome Co.,** a subsidiary of Goldfield Consolidated Mines Co. of Nevada and San Francisco, is building a complete camp near the Mouat mine, at Absarokee. The camp will house and furnish facilities for men to mine and mill chrome ore, in the early part of 1953. One hundred men are employed on present construction.

★**A rich strike of silver ore** has been reported in western Montana near the Idaho border by a highway bulldozer crew. The property is near Saltese, Mineral County, and the strike has resulted in the location of several new claims.

★**A 5-ft.-vein of strong silver,** copper and lead mineralization has been opened in a tunnel 30 ft. below the

HARDINGE
MILLING
EQUIPMENT



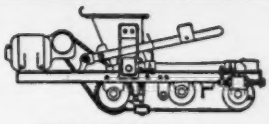

MILLS

HARDINGE CONICAL BALL and PEBBLE MILLS for grinding wet or dry in open or closed circuit, either for granular or fine products, depending upon method employed. Conical shape of Hardinge Mill causes rapid circulating and classifying action within drum, which increases capacity for power expended over other types. Bulletin 17-B-1 gives details of dry grinding applications; Bulletin AH-389-1, wet grinding.

HARDINGE TRICONE MILLS have tapered barrel which causes correct ball alignment. Grinding energy conserved. Ball consumption reduced. Tricone Mill occupies less floor space for a given grinding volume than any other type mill ever built. New design bearings reduce friction and cut overall power consumption about 5%. Bulletin AH-414-1.

HARDINGE ROD MILLS employ steel rods as grinding media. Ideal for producing minimum oversize in open circuit grinding. For wet or dry grinding. Convex or conical heads reduce friction, prevent congestion of charge at ends, and align rods. Bulletin 25-C-1.

Also Cylindrical, Tube, and Batch Mills.



Constant Weight Feeder

FEEDERS

CONSTANT-WEIGHT FEEDER measures by weight, not volume, thus compensating for variations due to specific gravity changes, bulking or size of material. Feeder is quite accurate, and affords automatic feed control for crushers, pulverizers, mixers, dryers, kilns, furnaces and conveyors.

Also Disc, Non-Flooding, and Volumetric Belt Feeders. Bulletin 33-D-1.

Auto-Raise Thickener

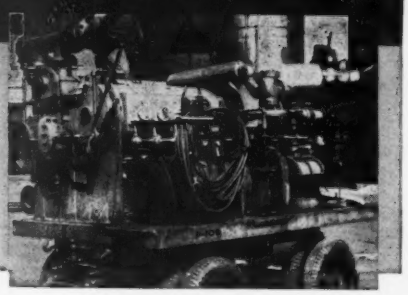
THICKENERS

HARDINGE "AUTO-RAISE" THICKENERS feature spiral scrapers, which clean bottom of tank with each revolution, and "Auto-Raise" driving mechanism, which automatically lifts scraper away from overload or obstruction in tank bottom, eliminating costly breakdowns and delays. Bulletin 31-D-1.

(See Branch Office Addresses on Opposite Page)

HARDINGE

# GUARD AGAINST EXPLOSION with R-C INERT GAS GENERATORS



Portable R-C Inert Gas Generator used for purging operations and stand-by protection in large gas-producing plant. Capacity 15,000 cfh.

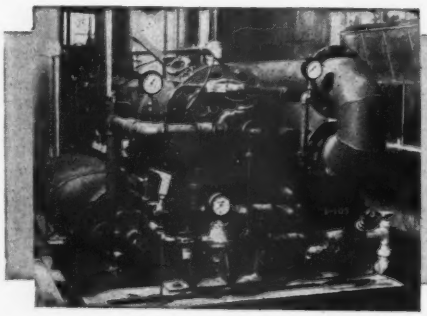
If your operations involve materials or processes which might cause an explosion-produced fire, you can reduce the risk with R-C Inert Gas Generators. In many instances, the relatively small cost is absorbed by savings in insurance costs.

These mobile or stationary units instantly produce a continuing flow of inert gas, for use in purging gas or liquid lines, blanketing dangerous areas and for many other industrial uses involving the handling or storage of explosive materials.

R-C Inert Gas Generators are compact, simple and inexpensive to operate, with either oil or gas as fuel. They are available in capacities from 1,000 cfh to 50,000 cfh, with characteristics to match specific requirements.

Where even a relatively low explosion hazard exists, one incident might produce a disastrous fire. Ask for details on how such dangers may be averted with R-C Inert Gas Generators.

ROOTS-CONNERSVILLE BLOWER CORPORATION
526 Washington Avenue, Connersville, Indiana



Installation of three R-C Inert Gas Generators similar to this one helped one large plant save $6,000 per month insurance premiums, as well as substantially reduce danger of production losses caused by explosion or fires. Capacity of each unit, 6,000 cfh.

Reg. U. S. Pat. Off.

ROOTS-CONNERSVILLE BLOWER
A DIVISION OF DRESSER INDUSTRIES, INC.
BLOWER BUILDERS SINCE 1854


## Montana *(Continued)*

surface at the Prosperity mine northwest of Superior. Missoula interests headed by Fred Wilson, Jr. and Mauritz Engdahl are developing the ground.

## NEVADA

★**Natomas Co.** is washing approximately 8,000 tons of gravel daily with its big dredge at the Greenan Placers in Lander County. The boat, formerly at Manhattan, has a capacity of 10,000 yd. of the material on a 24-hour basis. The company employs 40 men in the operation.

★**Copper Canyon Mining Co.** in Lander County is producing 300 tons of lead-zinc-gold-silver ore daily. The mill on the ground is capable of handling 350 tons daily. The property lies 18 mi. south of Battle Mountain and employs 68 men.

★**Lucky Strike mine,** operated by United Minerals Corp., is producing 15 tons of lead and zinc ores daily. The material is hauled to Battle Mountain where it is shipped by rail to smelters in Utah. George W. Snyder is general manager, and Glenn Johnson, of Battle Mountain, is superintendent. Work has been started on the sinking of a shaft and developing a drift.

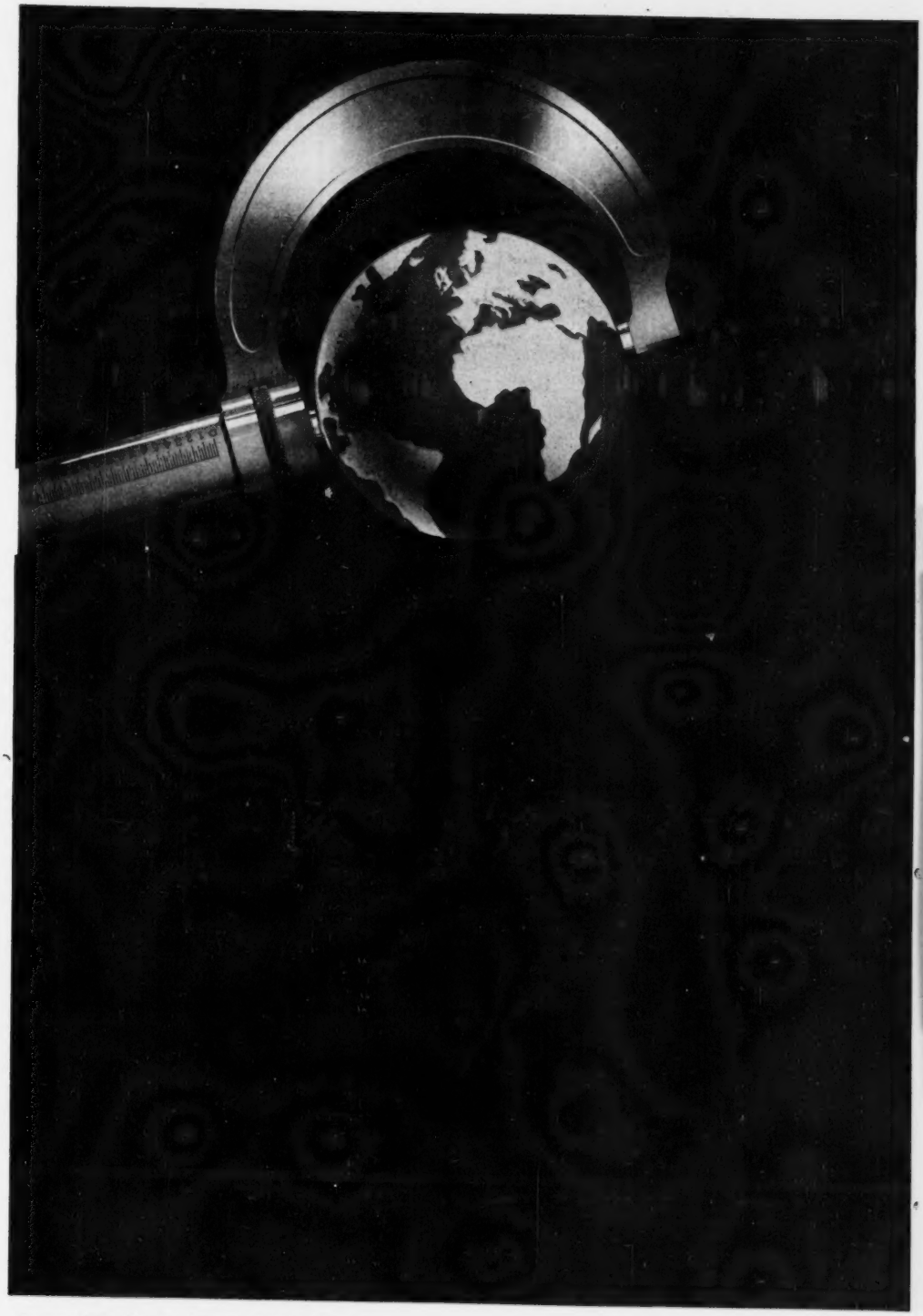
★**Mohawk Mine** in the Argentite district of Esmeralda County has 16 men employed, some of whom are building a camp at the location. The mill which is situated at Silver Peak is reported operating at full capacity, processing ores from the dumps and other properties in the area.

★**Combined Metals Reduction Co.** is proceeding with construction of its new tungsten mill at the Caselton plant near Pioche. Major items of equipment are on hand and test work on the various ores is nearly complete. Combined Metals has been custom milling lead-zinc ores on a competitive basis for 30 years, and when the new mill is completed it expects to bid for tungsten ores on the same basis.

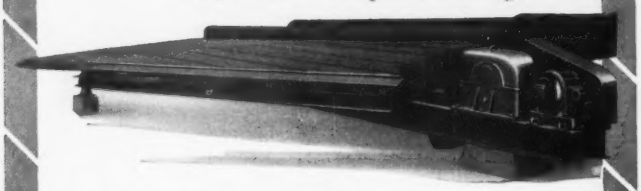
★**The T-Bone mine** in Lander County has 14 men working under the management of F. D. Schuck, superintendent. Tungsten ore, being produced in large quantities, is stockpiled awaiting completion of a new 100-ton mill at Sunnyside.

★**Construction has begun** on the fluorspar mill the Kaiser Co. is building near Fallon. Heavy equipment has been clearing the site. Material is on hand for building a spur railway track to the location, and for covering an irrigation ditch which runs through the property. The mill is expected to cost $417,000. When complete it will handle ores produced from a wide area in central Nevada.

★**Drilling operations** are being conducted by the Newmont Mining Co. in Goldfield. Drillers began coring at 300



# Efficient Separations of Minus ¼" Feeds Easy for *SuperDuty*



The usefulness of the SuperDuty Diagonal Deck Concentrating Table is broad, as it handles any feeds within the ¼" × 0 range easily.

Recoveries of metallics or other mineral values of various specific gravities are exceptionally efficient and economical. No other table or process so well combines the production of high grade concentrates with low operating cost.

So efficient is the SuperDuty that many units have been used profitably to recover additional values from the tailings produced by other processes.

Deck coverings and riffling contours are furnished to meet the operating conditions of each installation.

For full information about this thoroughly proved and accepted table, write for the new Bulletin 118B.

**CONCENCO SPRAY NOZZLES**

These handy nozzles are simple, flexible and economical. All you do is drill your holes, clamp on and get results. They can be definitely aligned for washing, sluicing or spraying according to need. They are removed or replaced in a moment's time.

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CONCENCO PRODUCTS

★ *The ORIGINAL Deister Company* ★ *Inc. 1906*


## Nevada *(Continued)*

ft. and were down 420 ft. at last report. Jack Green is foreman, and Malcolm MacPherson is in charge for Newmont.

★**Heavy damage** was done to the antimony mine near Austin belonging to Tony Romano as a result of snow slides during the winter. Heavy equipment was scattered all over the landscape and two large houses were reduced to kindling. Reconstruction work will be delayed for some time because snow drifts are still deep in the area, which is at high elevation.

★**Twelve men are at work** in the Last Chance Mining Co. antimony mine in Wall Canyon, Nye County. Jarl Gibson is superintendent, and a smelter is being erected with a capacity of 50 tons daily. A new headframe and ore bins are also being constructed.

★**A shaft is being sunk** in the Commodore tungsten mine in Smokey Valley, Nye County. Smith Bros., of Gabbs, and Barney O'Malia, of Hawthorne are operating the property which is one of the largest of several mining ventures in that area. Same management is operating other tungsten properties in the vicinity and ore is being shipped to Gabbs.

★**William Donovan,** well-known mine and mill operator at Silver City, has contracted to strip, mine and crush thousands of tons of barite ore for the National Lead Co. in their Rossi property north of Battle Mountain. Twelve men are working at the site. About 5,000 tons of ore is being produced monthly, in addition to which 15,000 tons of waste is being moved to open and develop the promising barite deposit.

★**Three jigs and a magnetic separator** are being installed at the Dutch Flat mine near Winnemucca, for the purpose of recovering cinnabar, scheelite, and fine gold which was lost in previous operations. It has been necessary to build 16 mi. of new road to the property to move in heavy equipment. Bins are being erected, and the washing plant is being enlarged.

★**Gold Acres Mine and Mill** in upper Lander County employs 54 men. About 430 tons of gold ore is mined and treated daily in the cyanide plant. Ore is taken from an open pit where considerable stripping has to be done.

★**Getchell Mine Inc.** is operating the Granite Creek mine, the Riley mine, the Granite Creek lower tunnl, and the Pacific and Kirby pits in Humboldt County. At the Granite Creek property, 24 men are producing 165 tons of tungsten ore daily. At the Riley mine, 10 men are recovering about 40 tons daily from two drifts. At the Granite Creek lower tunnel, 48 tons of waste material is being taken out daily in order to drive the tunnel under the Granite Creek deposit. At the Pacific and Kirby pits, 11 men are employed in stripping work.

## NEW MEXICO

★**A comprehensive survey** to determine the extent of mineral deposits on the 16-million-acre Navajo-Hopi Indian reservation in New Mexico, Arizona, Utah, and Colorado, will be made during the next two years by the New Mexico Institute of Mining and Technology, the University and state colleges of Arizona, under contract with the Department of the Interior. This will be the first overall survey and geologic mapping ever undertaken on the reservation.

★**A uranium ore purchasing depot,** 8 mi. west of Grants, N. M., began buying ore for stockpiling early in June. Depot is operated by Anaconda Copper Mining Co, which holds a contract with the AEC. F. A. Sitton Co., Santa Fe Railway Co., Zuni Milling Co., and Anaconda are the largest operators in the uranium mining areas recently discovered east and west of Grants. The depot is at the site of a mill Anaconda is building to process uranium ores of the district. Many small independents are rushing ore to the depot.

★**Peru Mining Division** of the Illinois Zinc Co. in Grant County has reduced operations as a result of a 2¢ drop in the price of zinc.

★**Charles L. Bradbury,** manager of the Raskob Mining Interests, Inc., New York, and Col. Charles F. Williams, Santa Fe, former senior mining engineer for the U. S. Geologic Survey, plan to re-open copper mining operations in the Ortiz and San Pedro Mountains south of Santa Fe, N. M. They have had approval of an $83,700 loan from Defense Minerals Administration, estimated half of their exploration costs.

★**International Minerals & Chemical Corp.** plans a $175,000 office building to be erected at the plant site 30 mi. east of Carlsbad.

★**Potash Division of Duval Sulphur and Potash Co.** is now operating at its designed capacity of 2,500 tons of sylvite ore per day at its plant east of Carlsbad. Duval holds leases on 6,525 acres of government land and 10,163 acres of state land. Additional acreage is held under prospecting permits, and the company is engaged in exploratory drilling to increase its ore reserves.

## NORTH CAROLINA

★**North Carolina Mining Division** of the U. S. Bureau of Mines has moved its offices from Raleigh to Asheville to make room for a special minerals research division of the Atomic Energy Commission.

★**Carolina Mineral Co.** of Kona and Spruce Pine has been ordered by the Fourth Regional Wage Stabilization Board to pay a penalty of $9,629 for excess over allowable wage rates paid


Familiar Scenes
IN MINING SERVICE

Water Lines by NAYLOR

Typical of the uses of Naylor pipe in water service are these lines handling mine discharge, sewer overflow, shaft pumping and tailings operations. There are good reasons why you see so much Naylor pipe in this service. Its light-weight makes for easier installation. Its distinctive structure assures extra strength and safety for the heavy-duty service you require. Naylor comes in diameters from 4" to 30" to meet your requirements.

*Write for Bulletin No. 507.*

NAYLOR PIPE

**Naylor Pipe Company**
*1243 E. 92nd St., Chicago 19, Ill.*
*New York Office:*
*350 Madison Ave., New York 17, N.Y.*

# 90% to 99% recovery of smelter dust?

**Research Corp. Engineer** — Yes sir. Over 1200 installations prove the high collection efficiency of Research Corporation Cottrells.

In one installation, 6500 pounds of smelter dust containing 14% cadmium and 30% lead are recovered per day.

**Smelter Executive** — What about draft loss?

**Research Corp. Engineer** — It's extremely low—only a few tenths of an inch of water.

**Smelter Executive** — Do you actually guarantee performance?

**Research Corp. Engineer** — Absolutely. And you can depend on Research Corporation because of our 38 years of experience in the field of electrical precipitation. That's your yardstick of performance.

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## New Mexico *(Continued)*

out during 1951. The penalty, largest levied by the agency, takes the form of a disallowance for income tax purposes. This means the company may not claim that amount as operating costs on its tax statement.

Newdale Mica Co., Kona, was also penalized for overpaying its 30 employees. The amount: $765.

★**Foote Mineral Co.** is now mining more than 350 tons of pegmatite a day from its property 5 mi. south of King Mountain. The company says the property has taken on commercial significance as a supply of lithium-bearing ores. Open pit methods are used in mining and spodumene is obtained by flotation from the crushed pegmatite. Possible by-products include tin concentrates, columbite, feldspar, mica and silica quartz.

## OREGON

★**Manganese ore** is being produced at the Sheep Mountain mine near Durkee, Baker County, by a company headed by Paul W. Wise, Boise, Idaho, who has leased the property.

★**Apex Smelting Co.**, Chicago, plans construction of a commercial pilot plant in the Eugene area for production of intermediate alloys containing aluminum and silicon. Exact location of the plant has not been determined. The project is part of a five-year development program started when Apex began investigations in reduction of clays which contain these metals.

★**Pedro Bros.** have resumed placer operations on Conner Creek, a tributary of Snake River in southern Baker County. Gold is coarse and found only on bedrock.

★**A new condensing system** has been installed at Bonanza mine in Douglas County without any shutdown in quicksilver production. New development work is under way at both ends of the orebody.

★**Chrome News: In preparation for heavy ore hauling,** Josephine County is improving the Galico Road between Hellgate Bridge and Chrome Road junction. . . . **Hayes & McCaleb** have completed construction of a chromite concentrating mill at the McCaleb ranch, 12 mi. west of Selma. Ore will come from properties on Pearsoll Peak and upper Chetco areas. . . . **Exploratory work** is being done by Carl Anderson at the Red Dog Mining Co.'s property in the Briggs Creek area northwest of Selma, Josephine County. . . . **Ben Baker** has installed a small concentrating mill at the Sourdough mine on Baldface Creek in southern Curry County. . . . **The Mary Walker claim** on Red Dog Creek south of Galice is being mined by Lou Robertson. . . . **E. K. McTimmonds, Selma,** has reported exposure of a new lens of chromite on the Luck Star claim,

located near the Oregon Chrome mine, northwest of Selma.

## TENNESSEE

★Tennessee Copper Co. has received the green light from DPA to proceed with its expansion program at Copperhill to increase sulphuric acid production. Cost of the program is estimated at $2,944,500.

## UTAH

★Strikes at Park Utah Consolidated Mines at Park City and Keetley, and at Chief Consolidated, Dragon and North Lily Mines in the Eureka field served to bear out on June 30 the contention of Utah mine industry spokesmen, that widespread difficulties would result from a pay-boost ruling of the Wage Stabilization Board. A total of 600 men were idled by the dispute.

The WSB order provided 8¢-per-hour pay increases, differential increases in 12 job classifications, and cost-of-living boosts at three Utah operations retroactive to July 1, 1951. The mines coming under the WSB ruling were those of the United States Smelting, Refining and Mining Co. with 1,100 men involved; Combined Metals Reduction Co., with 300 employees; and New Park Mining Co., with 300 men.

CIO United Steelworkers of America leaders were immediately reported seeking similar wage gains at underground mines in Utah not covered by the Wage Board order, and mine industry spokesmen said that, despite the present depressed condition of lead-zinc prices, 1952-1953 contracts expiring July 1 were being sought by the unions on the basis of the WSB findings.

Discussing the WSB ruling, Miles P. Romney, Utah Mining Association manager, asserted: "The decision not only undermines the economic position of Utah lead-zinc mines, but created a very difficult situation for lead-zinc operations throughout the country in the wage pattern set." He reported mines in Idaho, Arizona and Montana "had agreed on a miner's wage rate for an 8-hour shift of $13.54, 14, and 13.47 on a voluntary basis. The miner's rate in these areas has traditionally been above the Utah mines rates, "but the differential is upset.

"In the WSB decision in the steel case," he stated, "a price increase to offset added labor costs was a definite consideration. But in the Utah mines decision, the depressed prices for metals were ignored."

Romney said the decision grants increases of 21.4¢ in the New Park case, 16.7¢ in the Combined Metals case, and an upper limit of 18¢ in the USSR&M case. He pointed out that WSB regulations permit wage increases to July 1, 1951 of about 12½¢ of wages received in the first payroll period in January 1950. Utah mining

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## Utah *(Continued)*

companies involved, he stressed, "had in this period granted increases of 15¢ an hour, which left only about a 2¢ per hour increase permissible under regulations No. 6 and No. 7. As those cases involved wages for the period beginning July 1, 1951, it follows the board should have considered the cases in the light of the then existing regulations."

The Utah Mining Association spokesman asserted: "If the board considered the cases on a basis of cost of living during the period involved, the increases granted were not consistent. . . . If the board considered the cases on economic grounds they were again inconsistent, for metal prices were 17¢ for lead and 17.5¢ for zinc, as of July 1, 1951, compared with 15¢ for lead and zinc at the time of this decision."

Aside from the chances for a temporary 30-day extension of present contracts, industry negotiators facing both CIO and International Union of Mine, Mill and Smelter Workers leaders across the bargaining tables in Salt Lake City saw little hope for guaranteeing production without industry-wide work stoppages. Faced by the three Utah walkouts based on disagreements over expiring rates, and the drop in lead-zinc prices that had already brought about talk of shutdowns in the Park City district, even federal mediation officials were reported a bit gloomy.

As the June 30 expiration date for 1951-52 contracts approached, Federal Conciliator S. Lyle Johnson in Salt Lake City, reportedly "overburdened" by the picture he confronted, was joined by Federal Mediation Commissioner Ralph Williams of San Francisco in arranging discussions.

Kennecott Copper Corp. officials met with representatives of five unions bargaining jointly for some 5,000 Utah workers—including spokesmen for Mine-Mill, the Brotherhood of Locomotive Firemen and Enginemen, and the International Association of Machinists. Any contract action taken by Mine-Mill was seen likely to set a pattern for negotiations affecting men at Kennecott properties at Ray and Hayden, Ariz.; Hurley and Santa Rita, N. Mex., and at Ely, Ruth, and McGill, Nev. Discussions on a new CIO Steelworkers contract with USSR&M, with Commissioner Williams sitting in, were seen as basic in arriving at industry-wide contracts for nearly 3,000 lead-zinc field workers in the state, although there seemed little hope for immediate negotiations of the Park Utah Consolidated-Chief Consolidated-Dragon Consolidated-North Lily walkout.

★**Led by Gov. J. Bracken Lee,** over 1,200 Utahans gathered at Midvale on June 26 to mark the 50th anniversary of the state's oldest operating smelter. Ceremonies were held at a stand adjacent to the reduction center of the

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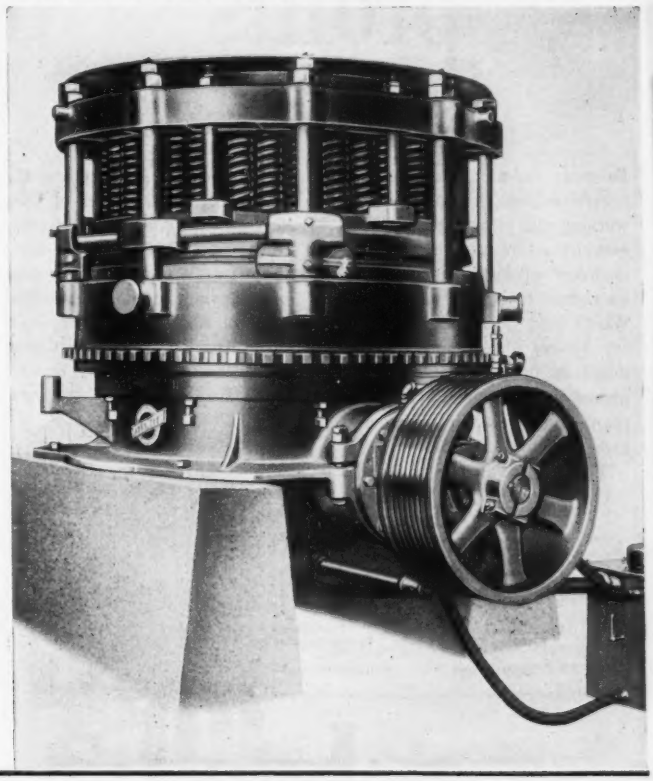

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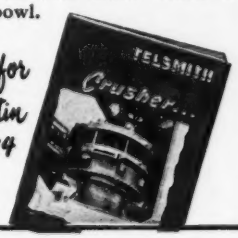


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## Utah *(Continued)*

United States Smelting, Refining & Mining Co. operation, with Governor Lee stressing to "employees as well as stockholders" that "there can be no jobs where there is no profit."

★**Utah production of gilsonite** reached 81,000 tons during 1951 according to a report of the Bureau of Economics and Business Research of the University of Utah. Survey is one of the first giving data on mining of the hydrocarbon and notes that gilsonite diggings now employ 205 miners with an industrial payroll of $750,000 per year.

More than half the Utah production was handled by the American Gilsonite Co., affiliate of the Standard Oil Company of California and Barber Oil Corp. Second largest producer is the Castle Peak Mining Co. with locations south of Myton. Other firms with operations in Duchesne or Uintah counties, are the American Asphalt Co., Utah Gilsonite Co. and Raven Mining Co.

Commercial deposits lie in a belt some 60 mi. long and 30 mi. wide. Most production is shipped in gondola-type trucks 125 mi. by highway to Craig, Colo., although some is trucked to Provo, Utah.

University survey notes transportation has been a major factor adversely affecting gilsonite producers since the turn of the century, when wagon trips to railheads consumed three weeks. A narrow gauge railroad that operated to the district beginning in 1904 shut down in 1939.

About 25% of the Utah-mined hydrocarbon is marketed abroad in Britain, Germany, Australia, Japan and India.

Due to a recent drop in price for heavy refined oils, The American Gilsonite Co. at Bonanza has temporarily suspended the piping of melted gilsonite fines through its Rangely-Salt Lake City crude oil line.

★**Consolidated Uranium Mines, Inc.,** has reported to stockholders production of 5,454 tons of uranium ore during the period of Dec. 1, 1951-April, 1952, from properties at Temple Mountain, Utah.

Company President E. G. Frawley noted the total production of Consolidated Uranium and predecessor firms at its Emery County properties is thus boosted to 26,873 tons.

Gross sales of ore during the cited 1951-52 period were given as $150,788. April shipments, among the largest on record, totaled 2,100 tons and grossed $54,244. May shipments were set at 2,053 tons.

Work reported included completion of a 530 ft. haulage tunnel with a 75 ft. crosscut and a 30-ft. raise under Lower Mesa. Opening of mineralized faces containing both uranium and vanadium in North Mesa No. 2 and North Mesa No. 9 workings was likewise listed.

An incline shaft to make possible removal of mineralized matter indi-

cated by drilling in the Marchbank Canyon area on North Mesa is near completion. The Atomic Energy Commission has done some 75,000 ft. of wagon drilling in about 750 test holes on the upper or North Mesa, with assay and gieger counter tests indicating "substantial mineralization on containing uranium or vanadium values," according to the company report.

Consolidated Uranium Co. has itself completed several hundred wagon drill holes in South Temple Mt. area.

## WASHINGTON

★**Aluminum Company of America's** new $45-million reduction plant at Wenatchee began operation June 18, with a section of its first smelting line. As new units are constructed, production will be increased until annual plant capacity reaches 17-million lb. Chelan County's PUD power plant at Rock Island will provide most of the required 180,000 kw. The initial force of 100 workers will gradually be increased to 900. Construction, started about a year ago, is ahead of schedule and the plant should be completed before the end of the year if shipments of steel return to normal. Early in June a trainload of 30 cars brought 1,800 tons of alumina from an Alcoa refining plant at Mobile, Ala. W. N. Farquhar is works manager.

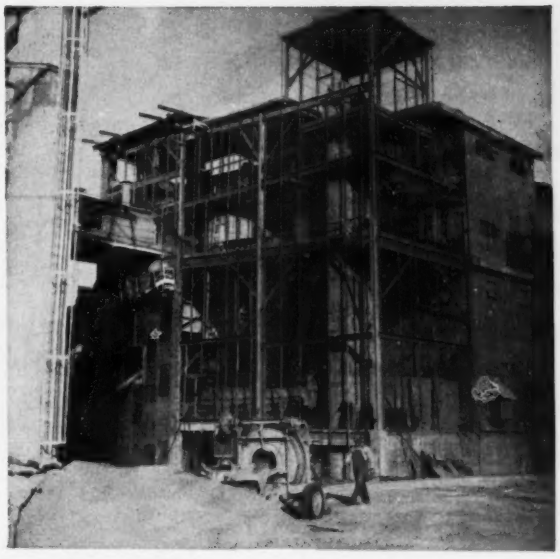
★**The state's production** of zinc in April was 1,729 tons, compared with 1,665 tons in March and a monthly average of 1,595 in 1951, according to the U. S. Bureau of Mines. Lead production in April was 1,214 tons compared with 1,293 tons in March, and the monthly average in 1951 of 663 tons.

★**The old German tungsten mine,** about 20 mi. west of Loomis, for 30 years, has been leased by the Border Lord Mining Corp., a company made up of Seattle interests, according to Dr. Louis S. Dewey of Okanogan. A road is being built from Loomis to the property. Supplies were flown in last summer and dropped by parachute. Wolframite and iron-tungsten ore were mined during the first world war.

★**A new orebody** has been opened by Jim Creek Mines, Inc., at its property near Ione, in the Metaline area, according to Val Y. Preston, president. DMEA has approved a $47,000 lead-zinc exploration project of which the company pays half the sum. A three-man crew has sunk an inclined shaft. Lead-silver-zinc ore occurs over a width of about 4½ ft.

★**A report** from the annual stockholders meeting of Metaline Mining & Leasing Co. held in June showed that Sullivan Mining Co. is continuing its aggressive development program at the property. Karl W. Jasper, president, reported that during 1951 there was a total of 1,904.5 ft. of drifting and crosscutting, 4,673.4 ft. of diamond drilling, 532 ft. of raising, 130.5


110 ADDED BARRELS PER HOUR



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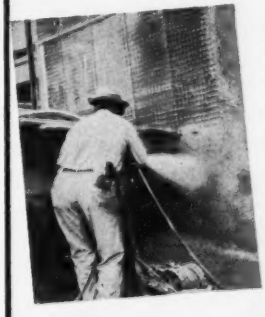

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## Washington *(Continued)*

ft. of station cutting, and 392 ft. of slabbing. At the end of 1951, the Sullivan company, jointly owned by Bunker Hill and Hecla, had spent $302,011 at the Metaline's properties. Plans for this year include extending the main manway and raises from the 600 to the 800-ft. level, crosscutting to the northwest toward the diamond drill holes 1, 5 and 7, made by the U. S. Bureau of Mines and raising from this to develop mineralization cut in the holes.

★**Columbia Lead & Zinc Mining Co.**, which holds 26 claims and 40 acres in the Metaline district, is seeking a DMEA loan, according to Robert P. Wallis, president. Half of the loan would be borne by the company through a stock offering of 425,000 shares of nonassessable stock at 10¢ a share. Preparations are being made to diamond drill the one known orebody. A ventilating system at the Hoage tunnel is being completed and equipment has been overhauled.

★**A strike of rich silver-lead ore** was found 200 ft. beyond old workings in the old lower tunnel at the Old Dominion mine near Colville, Earle B. Gibbs reported. Extent of the ore deposit had not yet been determined.

★Approximately 40% of the electrical energy sold by Bonneville Power Administration during the 12 months ending Feb. 29, 1952, was used by the Pacific Northwest aluminum industry. Sales to the various aluminum plants during the 12 month period totaled $13,599,999. These plants paid an average of 2.06 mills per kw., for 6,593,507,000 kwh. of energy, the report showed.

★**Cases of 12 of the 16 employees** of the Kaiser Aluminum & Chemical Corp. who were discharged by the company in Dec. 1950 were dismissed June 13. The employees were complainants in a NLRB action which charged "unfair labor practices." William Reyster of San Francisco who heard the case held that 12 of the employees had engaged in a "concerted work stoppage" when they stayed away from work at the Trentwood rolling mill Dec. 18, after a changed work schedule. He ruled that their conduct violated the "no strike" clause in the contract between the United Steelworkers of America (CIO) and the company and therefore the discharge was not in violation of the law.

★**Silver Mountain Mining Co.** at Tonasket is now installing a 200-ton mill and flotation plant, with provision for expansion to 500 tons. Miners are now drifting towards the apex vein on the property. Chief minerals are gold, silver, zinc and lead.

★**Pend Oreille Mines & Metals Co.** milled 102,000 tons of ore during the first quarter of 1952, and the Reeves MacDonald, across the Canadian border, milled 82,500 tons, according to Jens Jensen, vice president.

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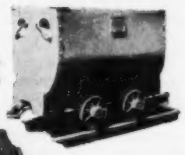
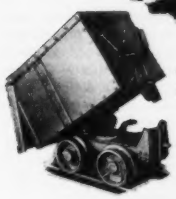
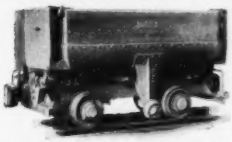
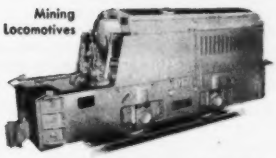

U-Body Mining Tubs


Three-Way Dump Ore Mine Cars


Granby Type Cars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# IN CANADA

## ALBERTA

★ Discovery of indications of uranium ore for the first time in northern Alberta are reported at Edmonton. The find is reported to have been made by a party of Edmonton prospectors operating north of Lake Athabasca, about 450 mi. north of Edmonton. Group includes Sydney Thibeault, Melton Johnson, and Henry Drever.

## BRITISH COLUMBIA

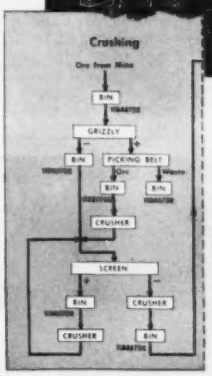
★ **Ainsworth Base Metals Ltd.** shareholders have approved a proposal to construct a 50-ton concentrator at the company's Black Fox property, adjoining the Cork-Province mine, near Kaslo, at a cost of $100,000. Mine has $17,000 cash on hand, proposes to raise the balance from sale of shares at 25¢ net to the treasury. Grade of ore to date averages $46.67 per ton; cost of mining, milling, freight and smelter charges will be approximately $20 per ton.

★ **Pacific Nickel Mines Ltd.** has made a deal with the Newmont Mining Corp., of New York, to share the cost equally of a geophysical survey of its nickel-copper property near Choate, 107 mi. from Vancouver in the Yale mining division, to discover enough ore to justify a mill. Newmont, which in Canada works through Berens River Mines Ltd., is sending a team of engineers using a new undisclosed method of geophysical prospecting. If additional ore is found, Newmont will become a partner in future development. Marketing of Pacific Nickel output will be simplified by shipping concentrates to Sherritt-Gordon refinery now being built at Fort Saskatchewan, near Edmonton, Alta. Pacific Nickel succeeded B. C. Nickel Mines on a one-new, for four-old share basis. The property has been inactive since 1936, except for survey work. Considerable underground work has been done. In 1940, ore reserves were estimated at 1,183,500 tons averaging 1.4% nickel and 0.50% copper.

★ **Slocan Lode Mines** has been incorporated to finance further development of the Vulture group of eight mineral claims on the north side of Carpenter Creek, 8 mi. east of Sandon. An expenditure of $12,000 on diamond drilling has been recommended by R. E. Renshaw, geologist, who reports one ore shoot contains an estimated 2,400 tons of ore grading 2.58 oz. silver per ton, 2.27% lead, and 15.08% zinc across 4 ft.

★ **Western Mines Ltd.** has boosted output at its lead-zinc-silver property on Kootenay Lake to between 2,100 and 2,500 tons a month. Grade runs close to 8% combined lead and zinc,


**Air Vibrators keep materials *moving***




***in crushing operation***

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Installation is easily made by simply welding or bolting a reinforcing plate to the skin of the hopper, and mounting the F in the lower third portion.

The CLEVELAND Type F may be operated with our Type JN quick-acting, lever type valve, with the valve lever actuated by the discharge gate of the bin.

Engineering recommendations on your particular problem made without obligation.

Air-cushioned types available where noise is objectionable.

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## Canada *(Continued)*

with an average of 2 or 3 oz. silver. The mill is to be pushed to its capacity of 3,500 tons monthly.

## NORTHWEST TERRITORIES

★ **Tungsten Corporation of Canada** expects a further stepping up of milling rate from 40 tons to 50 tons per day soon at its Outpost Island operation. Milling of high-grade tungsten-copper-gold ore recently was raised from 35 tons daily. Addition of a large pump will permit opening of the No. 5 level, to be mined in conjunction with No. 2 level. At 50 tons daily output, gross value of production is estimated at $75,000 to $80,000 monthly.

## ONTARIO

★ It is not expected that production of **Steep Rock Iron Mines** will be affected by the steel strike, although the company's market is entirely in the United States. Officials are confident that lower lake storage space will be adequate for the full 1952 output. Minimum objective for the season is 1,200,000 tons. Preparations for underground mining are going ahead on schedule, with shaft-sinking at the Errington mine completed, and the 700-ft. level crosscut well on its way to the orebody. Good progress is being made, too, on installation of the second dredge at the Hogarth mine, where the first dredge is removing clay and silt at a rate of 1.5 million cu. yd. monthly. The second unit will be in operation before year-end, with start of open pit iron ore production scheduled for 1953.

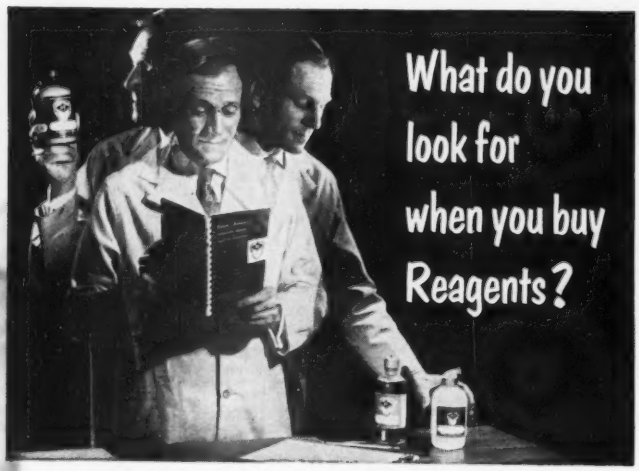
★ Although costs were up from $14.11 to $14.39 per ton, and recovery down from $20.30 to $18.72 per ton, net earnings of **Cochenour Willans Gold Mines** in 1951 were 11.1¢ per share. Operations at the property (Red Lake area) are continuing at normal tempo. The main shaft is being deepened to open five new levels. Main exploration interest this summer is focused on the adjoining ground which the company has optioned from Marcus Gold Mines, on which surface drilling is being started.

★ Steady progress is reported by **Falconbridge Nickel Mines** in its expansion program designed to lift production of nickel from 28 to 35 million lb. of nickel annually. The new converter (the fourth) is now being readied for operation, and delivery has been promised for the fall on an additional furnace. Full production increase will not be effected until 1954, but next year's output should be at least 30-million lb. according to current estimates.

★ **McIntyre Porcupine Mines** has been encountering excellent results in lateral work at depth, the annual meeting was told. On the 5,975-ft. level, more than 750 ft. of ore has been opened, with grade 0.34 oz. gold per ton and average width at least that of the drifting. On the 6,825-ft. level more than 200 ft. of similar ore has been opened; on the 6,425-ft. level, the ore zone has not yet been reached.

★ Ontario's newest base metal venture reports encouragement in surface drilling, with average grade of 11.3% zinc indicated across 26 ft. to a depth of at least 300 ft., but with length of the lens not yet determined. The showing is that of **Zenmac Metals Mines**, holding 1,130 acres 100 mi. east of Port Arthur not far from the north shore of Lake Superior.

★ In the Cobalt camp, **Norbert Silver Mines** has been formed to develop two adjoining properties in South Lorrain Twp., the former Harris and Montrose mine. In old-time operations three shafts were sunk and a small amount of lateral work was done at shallow horizons. Both properties have lain idle for many years but it is said that several good shoots of cobalt ore were left when operations stopped. The new company is financed by New York and Windsor interests.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## QUEBEC

★ **Canadian Johns - Manville Co.**, world's largest producer of asbestos, has its $14-million modernization program well in hand. A long-range plan under which all production will eventually come from underground, the program includes the sinking of a second production shaft, and the establishment of a new plant capable of turning out 600,000 tons of asbestos fiber per year, first section of which is scheduled for completion in January, 1954.

The company's Jeffrey mine, at Asbestos, Que., is one of Canada's biggest mining operations, with 16,000 tons of ore being treated daily. For many years all mining was by open pit; but 70%, or 11,000 tons, is now being mined from underground. It is estimated that the end of open pit operations will not be reached for another eight or ten years.

★ **Opemiska Copper Mines** continues to expand its ore picture through surface drilling while continuing plans to re-open the old underground workings. Work at the property in Levy Twp., Chibougamau area, has recently indicated a fourth zone, the best intersection showing 12.77% copper across 10.9 ft.

★ Construction is well advanced on the 300-ton concentrator being installed by **Weedon Pyrite and Copper Corp.** on its property 40 mi. northeast of Sherbrooke in the Eastern Townships. Start of production is scheduled for next October. At the same time the shaft and former workings are being rehabilitated, the company having $590,000 cash on hand through sale of stock and a $600,000 note issue. Ore reserves are calculated at 452,000 tons averaging 2.2% copper, 1.4% zinc, and 27% sulphur. A substantial part of this is new, being indicated in a footwall zone outlined by drilling and crosscutting at various horizons from the second to the 14th or bottom level.

★ Installation of mining plant and sinking of a three-compartment shaft are planned by **Lyndhurst Mining Co.** at its copper prospect in Destor Twp., some 25 mi. north of Noranda. Plans call for an initial depth of 585 ft., with levels at 175, 300, 425, and 550 ft. It is estimated that surface drilling has outlined 382,000 tons averaging 1.95% copper, 8.7% sulphur, and 0.5 oz. silver per ton.

★ Encouragement has been reported by **Hazeur Chibougamau Mines** in first results of work at its ground in Hazeur and Rasles Twps., Chibougamau area. Best showing to date is a vein which, for a length of 75 ft., shows considerable free gold across a width of 20 ft. in trenching. Arrangements are now being made for diamond drilling.

★ Likewise encouraging are the results secured in initial drilling by **Empire Oil & Minerals Inc.** on a new zinc prospect in LeTac Twp., Bachelor Lake district. A hole under No. 1 showing returned 31 ft. averaging 4.7% zinc, including a 7-ft. section that assayed 13.4%, and a hole under No. 3 showing encountered 11 ft. averaging 1.71% zinc. The drilling is continuing.

★Canada's newest gold producer, **Bevcourt Mines**, started milling last month. The 500-ton plant is now well tuned in, and is expected to be operating at capacity before the end of the summer. Financed in its later stages of development by Perron Mines, this Louvicourt Twp. mine has substantial ore reserves, including 65,000 tons broken, and plans are being made for leisurely expansion by deepening the shaft another 500 ft. to the 1,500-ft. horizon.

★One gold mine to go against the trend of rising costs last year was **Canadian Malartic**, Ventures - controlled operation in the Malartic area. Although tonnage milled was down fractionally from 470,705 to 462,203 tons, cost per ton was cut from $3.14 to $2.93. Gold output was down slightly at $1,450,891. Ore reserves were well maintained, the year-end calculation showing 2,260,000 tons averaging 0.109 oz. gold per ton, compared with 2,263,000 tons a year earlier.

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## Canada *(Continued)*

★What may be a new orebody has been indicated by lateral drilling on the 550-ft. level at the **Golden Manitou mine** in Bourlamaque Twp. Two drill holes put out to the north from a section east of the shaft returned wide sections; the better one shows 85.5 ft. averaging 1.5% copper, 0.015 oz. gold, and 0.42 oz. silver. It is possible that the showing is the upward extension of the copper orebody encountered a year ago on levels below the 1,210-ft. horizon, but observers are inclined to regard it as a separate deposit.

★Excavations for a 2,200-ton mill and an open-pit mining operation are being prepared by **Dominion Asbestos Mines**, with property in Ham Twp., Wolfe County, near St. Adrien, Eastern Twps. The company took over the ground formerly owned by International Asbestos Co., and estimates ore in sight at 23-million tons. The operation is strongly financed, with $1.7-million received from sale of treasury shares.

★**Campbell Chibougamau Mines** has negotiated an agreement with Washington's Defense Materials Procurement Agency for the sale of 63.2-million lb. of electrolytically refined copper as well as any cobalt that might be recovered. Price will be current market or 24.5¢, whichever is higher. Delivery of copper is to start in not less than 2½ years and be completed by Dec. 31, 1956

## SASKATCHEWAN

★**Uranium development activity** in far northwestern Saskatchewan is proceeding at an increased tempo despite bottlenecks created by a 4-ft. drop in the level of Lake Athabasca and a shortage of lumber. Sand bars in Lake Athabasca are hindering barge transportation of equipment from Athabasca River and the railhead at Waterways, Alta. Lumber shortage is partly due to the transport difficulty and to lack of a mill in the area. However, the mine and mill of Eldorado Mining & Refining Co. are expected to be in production next year. Between 1500 and 2000 men are engaged in uranium work around Lake Athabasca, and more than $8-million will be spent during the year. Another feature of this summer's work in the Athabasca area will be the lapse of uranium concessions. Companies now working concessions have the right to stake a certain percentage, but the remaining unstaked portion will be thrown open for staking by others during the first week in August. With numerous companies and individuals in the field, disputes are expected to arise.

★**Beaverlodge Uranium Mines Ltd.** reports that at the company's properties at Uranium City, diamond drilling crews are working 24 hours a day. Beaverlodge Uranium has purchased

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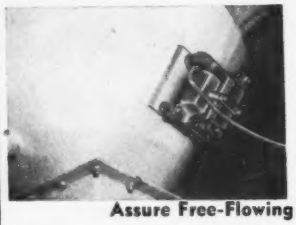

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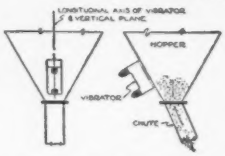

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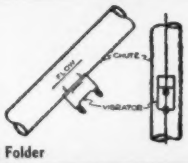


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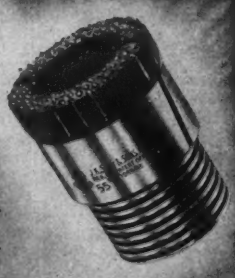

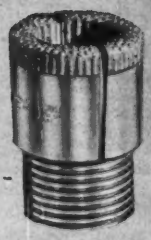

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## Canada *(Continued)*

a new large compressor and $25,000 in additional equipment. The No. 3 vein has been exposed by trenching for 1200 ft. and indicates high radioactivity. Drill holes centered at 60-ft. intervals show strong persistence to a depth of 80 ft. First drill hole in No. 4 vein revealed high geiger counter readings over a width of 4 ft. Trenching and opencutting have indicated a length of 750 ft. for No. 7A vein.

★**Potash has been revealed** in the first of a series of exploratory wells for Western Potash Corp., Ltd., at the company's 100,000-acre reservation near Unity, Saskatchewan. Top of the salt formation was found at a depth of 36.6 ft. and the well was bottomed at 3,675 ft. Coring was carried out in the salt and samples were taken at the potash horizon. A total of four wells is to be drilled to give the company sufficient data to determine location of a permanent production plant which may cost about $1.0-million. A pilot plant already has been successful in producing potash.

# IN AFRICA

★**Air transport** is being used increasingly to carry workers to South African gold mines from territories outside of the country.

★**Productivity of African** workers has been increased appreciably since 1945 through mechanization and advanced employee-relations programs. It takes only 88 Africans to do the same work today that 100 did in 1945.

★**South African gold mines** fared as follows during the first five months of 1952 (values in millions of dollars).

| | Jan.-May 1952 | Jan.-May 1951 |
|---|---|---|
| Working revenue .. | 167. | 157.5 |
| Working costs .... | 117 | 104 |
| Working profit .... | 44.7 | 53.4 |
| Additional revenue from premium gold sales ..... | 4.98 | 9.2 |

The 1952 figures include three new producers—St. Helena, Welkom, and West Driefontein.

★In the recent South African budget, the **tax on diamond mining profits** was raised to 45%. Diamond mining companies have pointed out that this high level is virtually confiscatory. As a result, DeBeers has dropped its plans to re-open Koffiefontein, and prospecting operations at the Kamfersdam mine, which it had hoped to open up.

★**A severe shortage of trucks and locomotives** in Northern Rhodesia may curtail shipment of copper to the U.S. and U.K. Of the 1,300 trucks on order for delivery by this time, only 30 have arrived. Delivery of special types of locomotives is also behind schedule. As a result, coal supplies to all consumers except copper mines have been cut by 20%, and deliveries of copper, lead, and zinc have been curtailed.

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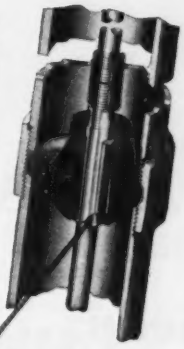

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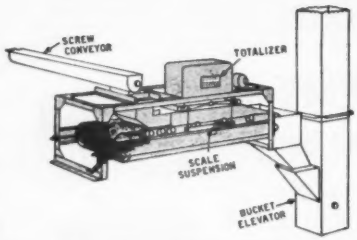


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## Africa *(Continued)*

★Both Sir Ernest Oppenheimer, chairman of the Anglo American group, and S. R. Fleischer, retiring president of the Transvaal Chamber of Mines have expressed the conviction that the price of gold must go up. Sir Ernest said recently than an all-round adjustment of the international gold prices will be an indispensable adjunct to present economic and financial measures if the world's trading developments are not to be continually dislocated by the recurrent balance of payment crises in the non-dollar world. Present exchange reserves are inadequate to prevent currency crises, and will ultimately require adjustment by a rise in the gold price.

Mr. Fleischer said that it is being realized more acutely that the Sterling Area's gold-currency reserves are close-linked with the output of gold. The British Commonwealth can no longer reply on external aid in the immediate postwar years. In solving the problems of the Sterling Area, the well-being of gold mining in the commonwealth must be a vital factor.

★Johnson Matthey and Co., the famous London refining firm, will form a subsidiary company in South Africa with offices in Johannesburg. The subsidiary will use domestic noble metals to manufacture the local requirements for jewelry, dental, and allied trades. It is expected that in time Johnson Matthey will handle the platinum refinery now being built at the Rustenburg platinum mine.

★Stilfontein G. M. poured the first bar of gold on July 1. This is the first mine operating on the Vaal Reef series. It is near the Western Reefs property in the Klerksdorp district, 80 mi. west of Johannesburg. Initial capacity of the plant is 50,000 tons per month. Over 98% of the reef ore encountered in this property averages 302 in.-dwt. This property has also been chosen as the site for a sulphuric acid plant to treat pyritic ore. The acid will be used to extract uranium by the company and others in the area. Loans from the Export-Import Bank, and the British Ministry of Supply were used to finance the plant.

★ Delegates of the British Government, the British Aluminum Co., and Aluminum Ltd. of Montreal who have been discussing a £150-million sterling Volta River project in the Gold Coast, have left for London to submit a report. The object of the project is to harness power of the 1,000-mi. Volta River, which crosses the Gold Coast from northwest to southeast, for the production of aluminum. Estimated bauxite reserves in the Gold Coast are 225-million tons. It is believed that about a million tons of this could be processed each year into 210,000 tons of aluminum.

★ Holman Bros. of Camborne, Eng., has established a branch at Nairobi to supply mines in Kenya, Tanganyika and Uganda territories.

# IN ASIA

★**Indian mineral production for 1951** was as follows:

| | | |
|---|---|---|
| Coal | 34,430,522 | tons |
| Asbestos | 7,501 | cwt. |
| Beryl | 4,225 | cwt. |
| Chromite | 15,567 | tons |
| Copper ore | 369,058 | tons |
| Diamonds | 1,012 | carats |
| Gold | 226,475 | oz. |
| Graphite | 20,986 | cwt. |
| Gypsum | 190,223 | tons |
| Ilmenite | 140,912 | tons |
| Iron ore | 3,655,161 | tons |
| Limestone | 2,918,192 | tons |
| Magnesite | 116,776 | tons |
| Manganese ore | 1,161,045 | tons |
| Mica | 218,739 | cwt. |
| Rock Salt | 5,432 | tons |
| Silver | 17,180 | oz. |
| Steatite | 636,079 | tons |

Total value of India's mineral output was estimated at $148-million. Total number of people employed was 549,048.

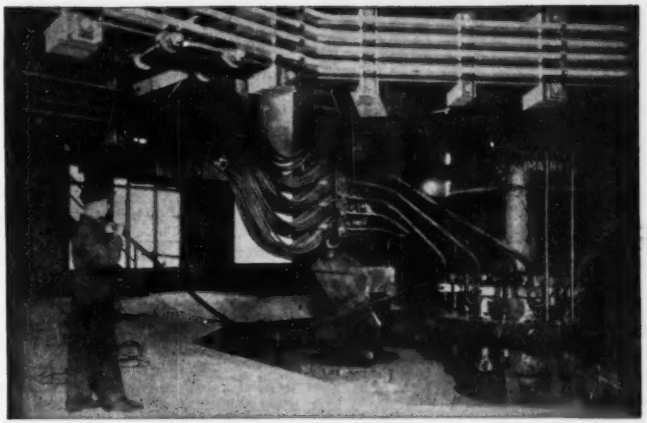
★**Indian mica producers,** alarmed by the drop in purchases by U. S. buyers, have urged the government to seek other markets and develop home consumption of the mineral. The three Indian States of Bihar, Rajasthan, and Madras together produce 80% of the total world output of mica—220,000 cwt. in 1951. Nearly all of this is exported without processing. The Rajasthan Industrial and Mining Association, which is seeking the government action, blames the large-scale export of mica waste at low prices as being partially responsible for the falling market. Another reason for the decline was said to be failure of mica exporters to supply up to sample.

★**India's total iron ore reserves** are now reported to be more than 10-billion tons as the result of two important finds reported by the Geological Survey of India. These were: 130-million tons in Madras State, and 800-million tons of high-grade iron ore in Madhya Pradesh.

★The Government of India announced **a decision to buy uranium ore** or concentrates containing not less than 0.4% $U_3O_8$. Heretofore the lower limit of materials purchased was 10% $U_3O_8$. New awards for the discovery of new uranium deposits and beryl deposits have also been announced by the government.

★**Japan shipped a $17.5-million consignment** of gold bullion to New York during June according to news reports from Tokyo.

★A new Japanese company, **Indonesian General Mining Corp.,** has been formed to exploit mineral resources of Borneo and Indonesia. The Kobe steel works will provide 20% of the capital in the form of mining equipment and technical advice. Kobe will also have first rights to minerals produced. Initially the company intends to work asbestos and manganese.

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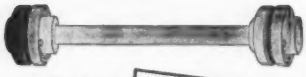

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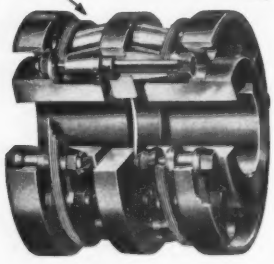

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## Asia *(Continued)*

★**Kokan Kogyo Kaisha,** a subsidiary of Japanese Steel Tubing, has recently signed up a provisional contract with **Metal Export Inc.,** an American firm, for developing an iron ore lease in the Kelantan State, Malaya. The American company obtained the leases from the Malayan Government, but has not found it profitable to go ahead with the development. Kokan Kogyo will pay a royalty of 10% to the American leaseholders. The deposits contain about 6-million tons of ore running 65% Fe, plus about 2% Mn.

# IN LATIN AMERICA

★**Government control of mining** by a semi-official body, similar to Petroleos Mexicanos which runs the oil industry, was advocated by the National Institute for the Investigation of Mineral Resources in a memorandum to Adolfo Ruiz Cortines, presidential candidate. Features of the plan are: government supervision of mining; establishment of copper, lead, and zinc refineries; establishment of iron and steel works to exploit domestic ores; establishment of mining machinery manufacturing plants; organization of laboratories and metallurgical plants; establishment of concentrating plants in mineral producing areas; systematic study of Mexican mineral deposits; technical and economic aid to revive abandoned mines; construction of transportation facilities for mines; increased power facilities for mines; provision of scholarships for students in Mexico and abroad; simplification of mining tax laws; insistence that technicians in mining and allied work employed by the government and semi-official organizations receive the same wages as like employees of foreign-capital backed mining companies who do the same kind of work; examination of a pending law that demands that foreign financed companies must have as large a number of Mexican personnel as possible; establishment of a semi-official credit institution to handle fiscal phases of the program and to trade in minerals to offset fluctuations in foreign metal and mineral markets, and to create stockpiles for emergencies.

Funds for the control body to administer the plan would come from a percentage of mining tax revenues now estimated to be $10.4-million yearly.

★**Fresh rumors,** officially denied, are being circulated that the peso will be devalued to 11 pesos to the dollar, perhaps after the elections. A shortage of dollars is reported to be exerting pressure in that direction.

★**The Mexican mint** is shopping around for more equipment to mint more silver because of a greater demand in the world market. The latest order for minted silver was from Saudi

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Arabia which called for $6-million in silver coins. Syria has made a similar contract, and coinage deals are pending with Dominican Republic, Lebanon and South America.

★**Petroleos Mexicanos** has made its first shipment of sulphur to Cuba. Tonnage shipped was 5,000.

★**The future of silver** doesn't worry Mexico because the Bank of Mexico has plenty of it—32-million oz., according to Finance Minister Ramon Beteta. The Bank, he added, has three-fourths of Mexico's 1951 silver output, despite large mintings for Mexico and other countries.

★May 12, the second anniversary of **Peru's new mining code,** was widely celebrated. Liberal features of the new code have given Peru's mining industry great impetus.

★**Minas de Venturosa S.A.,** in the Casapalca district, is undertaking installation of a 120-ton copper-lead-zinc flotation plant. Up to now the company has been exploring and developing its property.

★**Sociedad Minera Milpo** is now operating a group of lead-zinc mines situated between the Cerro de Pasco and Atacocha districts. Ores are being treated at their 100-ton lead-zinc concentrator.

★**Puquiococha,** with mines in Morococha, has recently increased output of the zinc concentrator from 300 to 500 tons of concentrates per month. A copper flotation section is also operating at the plant.

★**Sociedad Minera Yauli,** with mines at Sacracancha, is increasing mill capacity from 120 to 230 tons per day.

★**Reynaldo Gubbins, Jr.,** is operating mines near Ticlio, highest point on the Peruvian Central Railroad, elevation 4,835 meters. A 1,000-meter tunnel has been started and plans call for a 100-ton lead-zinc flotation plant.

★**Minas de Cercapuquio S.A.** is installing a new hydro-electric power plant of 800-kw. capacity at the operations near Huancayo. The new power plant will be used to operate a 250-ton zinc concentrating plant which will treat some 400,000 tons of zinc tailings averaging 14 to 20% zinc. These tailings accumulated in previous years when only the lead was recovered because of a lack of power to recover both lead and zinc concentrates.

★**Banco Minero del Peru** is promoting small mines in several districts. They have recently completed a 50-ton lead flotation mill in the Hualgayoc area in northern Peru, and will start work on a 50-ton lead-zinc flotation mill in the new Pacococha area. The Bank has also increased its lead-zinc plant capacity from 90 to 120 tons per day at Sacracancha, because of increased small-mine output in the Morocoha district.

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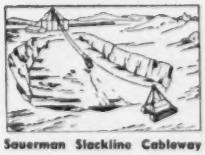

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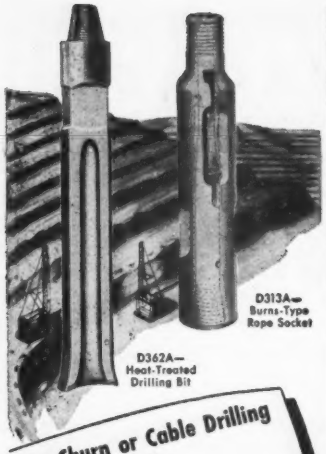


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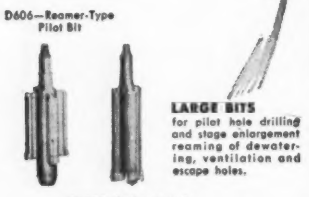


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## Latin America *(Continued)*

fields, Ltd., reports that during the period from Aug. 1, 1950, to Dec. 31, 1951, their operations in this colony produced 14,245 oz. of gold. The company is engaging in extensive prospecting work for gold in the Upper Mahdia section of the Colony and expects to increase its exploration and prospecting work in other areas here. In the meanwhile, they report dredges are being brought to the Konawaruk area to work low-grade deposits.

Estimated gold ore reserves at Dec. 31, 1951, were:

| | Cu. Yd. | Grains |
|---|---|---|
| Upper Mahdia.... | 2,130,000 | 3.75 |
| Lower Potaro .... | 12,840,000 | 4.32 |
| Upper Potaro .... | 9,800,000 | 3.47 |
| Konawaruk ..... | 26,000,000 | 3.08 |

★A group of Guatemalan investors are preparing to exploit chromium ore deposits in southeastern Guatemala, near Cabanas in the State of Zacapa, according to reports. In 1951 a mission from the International Bank for Development and Reconstruction reported high-grade chrome deposits in that area. It was estimated that chrome production could reach 900 tons per month within three months with simple surface operations. Poor transportation facilities have discouraged production in this area heretofore.

★**Bolivia's commission to study nationalization** of certain mines expects to turn in its report on Oct. 9, 1952, according to Manial Barrau, head of the commission. Mr. Barrau said that members of the commission are on "terms of mutual understanding with the firms of Patino, Hochschild, and Aramayo, which are cooperating by providing technical information." Nationalization will not affect a great number of firms established in the country, according to Mr. Barrau. Companies like American Smelting, for instance, organized with North American capital to exploit copper in the Corocoro area of La Paz Province, would carry on work as before. Enterprises like Patino, Hochschild, and Aramayo, however, were companies originally formed with Bolivian capital. The nationalization of mines was therefore not a measure aimed against foreign capital, Mr. Barrau said.

★**Compañia Minera de Guatemala** suspended operations at the operations near Coban in northern Guatemala because of low metal prices and extremely difficult transportation conditions. This operation has been one of the Republic's main exporters of lead and zinc during the past three years.

★**Colombia's output of precious metals** in April 1952 was 1,404,726.57 grams of gold and 389,300.93 grams of silver. Several foreign companies are reported to be studying lead deposits located near Santander de Quilichao in the Cauca Department.


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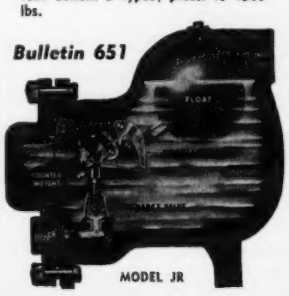


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# IN AUSTRALIA

★Near Noumea, New Caledonia, **Canadian and other interests** are planning a large prospecting campaign on several Pacific islands, reported to contain deposits of nickel and cobalt.

★**Mining of bauxite deposits** in Wessel Islands has begun. Shaft sinking has begun, and prefabricated houses are being erected for the personnel. If the deposits prove to be as satisfactory as expected, a plant to treat the ore might be constructed in New Guinea to save costs of transporting ore to Tasmania.

★From Tennant Creek, Northern Territory, comes news that the mining of high grade copper on the old **Tennant Creek gold fields** may cause another boom. Estimated copper production is expected to increase appreciably. High-grade copper ore is being produced on the old gold fields and Peko gold may become a rich producer.

★**Consolidated Zinc Corp.** has plans for constructing a zinc refinery at Cockle Creek with the intent of using zinc concentrates from the Broken Hill area. The refinery may cost between $15-million and $20-million with a capacity of 30,000 tons of zinc and a corresponding acid output.

★**Local demand for copper, zinc and lead** is easing up, and deliveries at controlled prices (greatly below world parity prices) are reported to be taking place without the usual delay.

★**A crisis is developing over antimony.** The only smelter refuses to hold stocks of antimony because of credit restrictions. Production is being limited because of this situation.

★**Manpower conditions are easing up.** Shortages held down production for the last few years. It is also expected that the cost of mine equipment will level off.

★**Australia's biggest copper producer,** Mt. Lyell, is now spending nearly $5-million on modern equipment to treat increased output, mainly by open-cut mining. Present copper output at the mine is 8,000 tons a year, soon to be brought up to 12,000 tons a year.

★**Tasmanian Tungsten Developments Co.** reports that rich ore is blocked out under the new prospecting shaft being sunk. It is expected that next drives will expose about 5,000 tons of ore giving 100 tons of wolfram concentrates.

★South Costerfield Antimony & Gold Mining Co. reports ore assays of 18% antimony and 17 dwt. of gold. Ore continued strongly underfoot in all reefs. This company will be absorbed into the newly formed **Victoria Antimony Mines Ltd.**

★**Cocks Eldorado** had to stop dredging because of heavy flooding.

★**Freeburgh Dredging** is at present working some of the rich ground yielding an average 6.6 grains a yard.

## NEW SOUTH WALES

★The value of the New South Wales output of heavy mineral sands doubled in comparison with last year's because of greater production of rutile concentrates and higher prices.

★Ore production from **New Broken Hill Consolidated's** leases during 1951 totaled 212,178 tons with production of 22,883 tons of lead concentrates and 46,231 tons of zinc concentrates. Much of the new surface plant has been now completed.

★A new company, **Barrier Central Pty. Ltd.** (wholly owned subsidiary of Broken Hill South) has been formed with capital of £1.5-million to operate certain Broken Hill leases. Recovering of the remaining ore will take about 8 to 10 years.

## QUEENSLAND

★**Tableland Tin Dredging N.L.** of North Queensland was refused government permission to sell tin ore on world markets. The company will now attempt to build up funds to finance dredge removal to new leases. The dredge has been Australia's greatest


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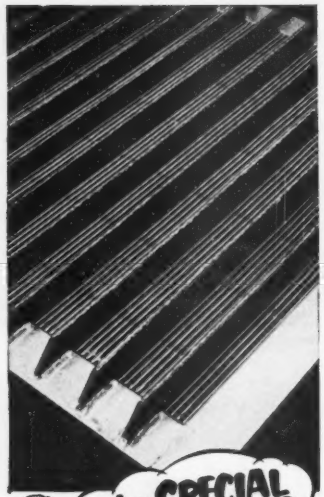

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## Australia *(Continued)*

tin producer since 1943 but sales at prices dictated by the government meant losses of $1.5-million.

★**Linden Gold** expects its treatment plant to start operating soon. Capacity would be 400 tons a month.

# IN THE PHILIPPINES

★**Marsman** officials express satisfaction over rehabilitation of their properties in the Paracale and Baguio fields. It is believed production can be steadily increased. However, this all depends on continued sale of 75% of the bullion in the premium gold market and no added wage increase in the provinces under the Minimum Wage Law.

★July production at the **Itogon mine** is set for 15,000 tons. All the Balatoc veins on the Itogon side of the line are being worked. These veins have been developed by Balatoc for almost 700 ft. below the Itogon 875 level, so future depth development at Itogon appears promising. The Itoe vein continues to yield good ore. The 1300 level drain tunnel which had been advanced 3300 ft. prior to the war has been re-opened and will be driven a total of 8000 ft.

★Gold recoveries at **Coco Grove** since the dredge "Mary Angus" resumed work after the 10-year shutdown following outbreak of the war have been somewhat disappointing. Prewar, when two dredges were working, it was possible to schedule one dredge in better than average ground if the other were in a lean area. The one dredge now operating has been digging far inland reworking the tailings from early day Australian dredges. An improvement is expected as virgin ground is dredged.

★At the **San Mauricio** mine a spectacular development is officially reported on the Sta. Inez vein where an entirely new orebody has been developed on the zero level for 150 ft., averaging about 0.78 oz. gold over an average width of 3½ ft. Considerable difficulty has been experienced in unwatering the Longos section of **United Paracale**, where the inflow is heavy. First shipments of concentrates from the mill show considerable copper and lead recovered with the gold.

★Vigorous development and exploration work is the order of the day at **Mindanao Mother Lode.** Over 1800 ft. of development drifts were driven in May. The No. 30 vein on the 1000 level is giving some encouragement. Another interesting drive in virgin ground has been advanced several hundred feet in fair grade ore. On the 850 level the Godbe vein looks good but water inflow is heavy. Substantial ore reserves remain above the 850 level on this vein.


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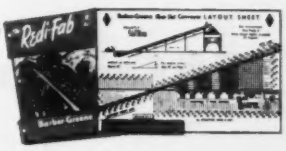

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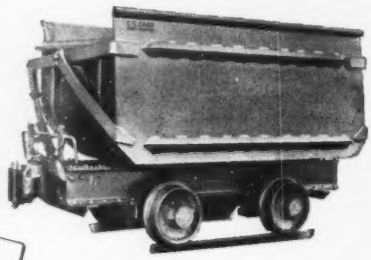

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DENVER, COLORADO


## Philippines *(Continued)*

★**Mindanao Mother Lode** has optioned the old **Toledo copper prospect** in Cebu and pursued an energetic development campaign since the first of the year. Some million tons of 1.5% copper and P2 gold have been proved up. The deposit can be worked by open pit mining method at low cost. Japanese ore buyers have been anxious to contract the concentrates for their smelters. A 500-ton mill is talked of.

★**Hixbar Mining Co.**, which is working the old copper mine on Rapu-Rapu Island, has concluded an agreement with the National Power Corp. to sell the latter the pyrite obtained in mining the copper ore, which is shipped to Japanese smelters. The pyrite is urgently needed for manufacture of sulphuric acid for the government's fertilizer project.

★A reconnaissance geological survey sponsored by the Bureau of Mines has confirmed the occurrence of copper, gold, and manganese on Cataduanes Island, 40 mi. from Legaspi across Logonoy Gulf. The interior section is virtually unexplored. Two coal districts have been identified. The coal is bituminous, partly coking, with about 13000 BTU. Coal reserves in the two districts may total 1-million tons.

Several copper exposures were noted. Veins contain high-grade ore, but widths are narrow. Some nuggets of native copper have been found. Gold occurs in many localities but no sizable orebodies are reported. Some prospecting has been done for manganese.

★An apparently large deposit of high grade iron ore is now under development in **Zamboanga Province**, according to Director D. Andreas of the Bureau of Mines. A rough estimate of ore available from one outcrop is 40,000 tons of better than 65% Fe. Float boulders are of large size. In another deposit nearby, some 55,000 tons of ore of the same good grade are exposed. The two deposits have about 110,000 tons of hard massive magnetite, averaging 60-65% iron with low prosphorus and sulphur. Silica averages less than 3%.

★**Still another iron deposit** is reported at Camalanjuan in Cagayan province by the Bureau of Mines. About 1-million tons is in sight as well as a large tonnage of float material. Average grade is 53-56% iron. The work thus far shows the ore to occur in beds about 3-meters thick in a sedimentary area of graywake and conglomerate.

# IN EUROPE

★**National Lead Co.** has acquired full ownership of **Titangesellschaft m.b.h** of Leverkusen, Germany. This plant is the largest of its type in Europe, producing titanium dioxide pigments for European consumption. Ilmenite for the plant will come from National Lead's mine and plant in Norway.

ANOTHER
COPPUS
"BLUE RIBBON" PRODUCT

This is the Coppus VANO. The propeller-type, best for shorter pipe lines, medium pressures.

This is the Coppus VENTAIR. A centrifugal blower, it is designed for long pipe lines, high pressures.

# *These are the cost-reducing Blowers that give up to 100% more air*

Only Coppus makes both types — and both are made especially for *mine* ventilation. One or the other, operating under the conditions for which it is designed, delivers from 30% to 100% more air for a given power consumption than an ordinary all-purpose fan.

They can be used as blowers or exhausters and are driven either by compressed air or electric motor, with capacities up to 90,000 CFM. Like all Coppus products, these blowers wear the "Blue Ribbon" that stands for high achievement in engineering, workmanship and performance.

*Representatives listed in MINING CATALOGS. Other Coppus "Blue Ribbon" products: steam turbines, gas burners, heat killers, air filters, blowers and exhausters for special purposes. See also THOMAS' REGISTER . . . Coppus Engineering Corp., Worcester 2, Mass.*

**COPPUS ENGINEERING CORPORATION**
288 Park Avenue, Worcester 2, Mass.

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Name .....

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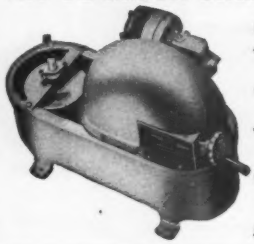
*Why is*
**THE CLARKSON STAINLESS STEEL REAGENT FEEDER**



*used more than all others?*

- Because it handles corrosive reagents. It's the only stainless steel machine of its type.
- Because it accurately measures and feeds from two drops to two liters per minute.
- Because it's compact and troublefree. It's the only simple reagent feeder using an integral gear motor drive.

*Write for bulletin on Model E.*

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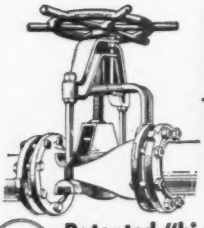
*564 Market Street, San Francisco 4, Calif.*



**Rubber Pinch Valves for Abrasive Pulps and Corrosive Liquids**

**Patented "hinged" Rubber Sleeve**

Recesses molded into sides of sleeve act as "hinges" during compression, eliminating excessive strain and wear. These valves have been used successfuly for many years by various industries, wherever there is a problem of transporting abrasive or corrosive pulps or liquids. Here are some of the other proved advantages of these valves:

- **Long Life Under Severe Conditions**
- **Unobstructed Flow Passage**
- **Positive Closure on Solids**
- **No Working Parts in Contact with Pulps or Liquids**
- **Only ONE Wearing Part**
- **Withstands All Chemicals Not Harmful to Rubber or Neoprene**
- **Sizes from 1" to 12" dia.**
- **Withstands pressures up to 150 psi.**

New free **CATALOG** gives complete information on Massco-Grigsby Rubber Pinch Valves; Marcy grinding mills for laboratory, pilot plant and commercial grinding; laboratory crushers and pulverizers.

**The Mine & Smelter Supply Co.**

**Box 5270, Terminal Annex, Denver, Colo., U.S.A.**
**Offices in Salt Lake City, El Paso, 1775 Broadway, N.Y.C.**

## Europe *(Continued)*

Erik Anker, managing director for Titan Co., a National Lead subsidiary, will be in charge of the Leverkusen operations. Although this plant was almost completely demolished by Allied bombing raids during the war, it has been rebuilt so that present output is treble that in prewar years. Production costs are among the lowest in Europe.

★**Recent uranium finds in the Black Forest** of Germany are worth mining, according to investigations made by the Geological Institute of Baden. Uranium content is in excess of 0.1%. It is reported, however, that these deposits are of lower grade than those in the Erzgebirge region where grades of 1.7% have been reported. The deposits were located with geiger counters in abandoned silver-nickel mines at Wittichen near Freiburg.

★**Open-pit bauxite mines** at Dabrica, near Stolac, Yugoslavia, are producing about 300 tons per day. Reserves are estimated at 300,000 tons. Total bauxite exports from this area are expected to be about 270,000 tons for 1952. This will be produced by the Dabrica mines and two other operations at Citluk and Crne Lokve.

★**The Danish Government** has decided to form a company to develop lead deposits in Northern Greenland. Initial capital would be 15-million kroner of which the government would contribute 4.12-million. Swedish and Canadian interests were each prepared to contribute 15% of the capital, the remainder to come from Swedish industrialists and banks.

★The British-owned **Rio Tinto pyrites operations** in Spain were in full production during 1951. Sales of pyrites rose from 822,866 tons in 1950 to 951,175 tons in 1951. Labor supply was barely adequate to maintain this output, and rising costs have overtaken internal prices paid for copper, sulphur and pyrites to the company. Another British company operating the Tharsis units shipped 709,673 tons in 1951. This company is developing the North lode of the Tharsis, a mine previously worked by French predecessors of the new firm. A plant involving hoisting, crushing, screening, conveying, and storage equipment has been ordered to increase output.

★**Potash mines of Cardona,** Spain, have recently been modernized to increase production. About 2,400 miners are being employed. Current production runs about 600,000 tons of sylvanite per year. After modernization these mines are expected to yield some 140,000 tons of potassium chloride per year.

★General Franco inaugurated a new plant to exploit **oil shale in the region of Puertollano.** Mining men expect to extract 1.2-million tons of shale per year yielding an estimated 132,700 tons of fluid hydrocarbons of various types.

FUMEALL

superior filter fabric

INCREASES THE LIFE OF SMELTER BAGS

**FUMEALL** filter fabric is saving money for many of the world's largest smelters. Actual operational studies show that **FUMEALL** which costs but little more than any other good all-wool filter fabric, lasts up to four times as long.

**FUMEALL** a combination of virgin wool and Dynel, combines the undisputedly superior filtering qualities of wool with the strength, heat, acid, alkali and moisture-resistance of synthetic fibers.

**FUMEALL** is available in the exact porosity and weave which meet your specific requirements.... **FUMEALL** can be ordered as yardage or can be fabricated into bags of any size and specification.

*Please write for additional details and samples of* FUMEALL *filter fabric for fume, dust or liquid filtration.*

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# NEW BOOKS

**Engineers and Ivory Towers.** By Hardy Cross, widely famed for his achievements in engineering practice and education. Edited by Robert C. Goodpasture. In the framework of this philosophical book you will find many sound views expressed which will go far to clarify some of the current hazy thinking about what an engineer is and how he is to be educated. For example—"One who is to become a teacher of engineering should be trained primarily to be an engineer, and association with the profession outside the ivory towers of learning is absolutely essential." And in another chapter we read—"There are groups of self-styled engineers who are telling the country how valuable they are, and how accurate are their conclusions. They take any general term, use it as an adjective and prefix it to engineer—social engineer, transport engineer, economic engineer, human engineer. These men attempt . . . to give the impression that they deal with measurable data from which definite laws useful to mankind can be deducted. They often call this leadership. Real engineers are tired of these leaders, of men who scorn details; engineers usually know what they are trying to do." It's hard to review this book without loading the comment with numerous additional quotations, equally clear, crisp, and thought provoking.

"Engineers and Ivory Towers" qualifies as recommended reading for high-school students contemplating an engineering career, engineering students, educators, practising engineers, and perhaps some who only think they are engineers. Published by McGraw-Hill Book Co., Inc., 330 W. 42d St., New York 36, N. Y. Pp. 141. Price $3.

**Metal Statistics 1952.** A handy pocket-size compilation of useful statistics for 1951 including information on iron ore, iron and steel, manganese ore and alloys, finished iron and steel products, fuels, aluminum, antimony, cadmium, cobalt, copper, gold, lead, magnesium, mercury, nickel, platinum, silver, tin, zinc, and all major ores. Statistics cover production and prices pertaining to metals. A classified list of sellers of primary metal and fabricated products is also included. Published by American Metal Market, 18 Cliff St., New York 38, N. Y. Pp. 864. Price, $2.50.

**Principles of Geochemistry.** By Brian Mason, Department of Geology, Indiana University. Chapter headings include the following: The Earth in Relation to the Universe, covering the origin of the solar system, composition of the sun, composition of meteorites, cosmic abundance of elements, the origin of elements; Structure and Composition of the earth, covering temperatures within the earth, internal

THE COTTRELL Whirlcone SEPARATOR

SAVES 4 TONS OF SAND PER HOUR

AT HARTMAN CONCRETE MATERIALS COMPANY BAKERSFIELD, CALIFORNIA

"Huge tonnages of clean, fine sand in the No. 50-No. 100 mesh range would be wasted in the overflow from the classifier at our Fox Plant, were it not for our 25-in. Cottrell Whirlcone in the circuit," declares Chas. M. Pomeroy, mix-design technician of Hartman Concrete Materials Co., Bakersfield, Calif. "Recovering—as it does—about 4 tons of valuable sand per hour at low cost of operation, the Whirlcone has paid for itself many times over during the two years in constant service."

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## Books *(Continued)*

structure of the earth, zonal structure of the earth, composition of the crust, geochemical differentiation of the earth, geochemical classification of elements; Thermodynamics and Crystal Chemistry; Magmatism and Igneous Rocks; Sedimentation and Sedimentary Rocks; The Hydrosphere; The Atmosphere; The Biosphere; Metamorphism and Metamorphic Rocks; The Geochemical Cycle—all of which add up to an intensely interesting and well-written text. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Pp. 276. Price $5.

**Prospecting for Uranium.** An up-to-date revised pocket-size edition answering all important questions that uranium prospectors frequently ask. Topics covered include: Uranium-Bearing Minerals; Where to Look for Uranium; Testing for Uranium; Prospecting with Radiation-Detection Instruments; Laboratory Assays and Selling Procedures; Laws and Regulations; Questions Frequently Asked; Sources of Additional Information; Manufacturers and Distributors of Portable Geiger Counters; Domestic Price Schedules; Licensing Regulations; Public Land Regulations; Laws and Special Orders. Eight full-color plates of common uranium minerals are included. Published by the U. S. Atomic Energy Commission and the U. S. Geological Survey. For sale by Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. Pp. 128. Price 45¢.

**The Mining Industry of 1951.** An excellent review of world mining activities by *The Mining Journal, Ltd.*, London. This May issue is compiled late enough in the year to incorporate final 1951 production figures and will serve as a valuable reference work for mining company officials, technical staffs, shareholders, stockbrokers, and metal dealers. Copies available at *The Mining Journal, Ltd.*, 15 George St., Mansion House, London E.C.4. Pp. 250. Price 7s. 6d. or $1.

**Wire Ropes in Mines.** A report of proceedings of conference held at Ashorne Hill, Warwickshire, Sept. 1950. One of the most complete, up-to-date, authoritative books on wire ropes ever published. Some 828 pages packed full of comprehensive data, tables, diagrams, photographs, and drawings cover every important phase of the worrysome problem of getting wire ropes to perform safely and efficiently. The text is a compilation of papers by expert authors from major mining areas of the world. A partial list of these papers includes discussions on the manufacture and properties of wire ropes; steel wire ropes used in mining; wire rope practice in Ontario mines; American wire rope practice; deep winding on the Kolar Gold Field; Belgian rope practice; winding ropes in the Ruhr; Australian rope testing practice; electronic rope testing; and others.

Published by the Institution of Mining and Metallurgy, Salisbury House, Finsbury Circus; London E.C. 2, England. Pp. 828. Price 50s or $7 postpaid.

**The following reports published by the U. S. Geological Survey may be purchased from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. at the prices specified:**

**Geologic Reconnaissance of the Mineral Deposits of Thailand.** Bulletin 984. Pp. 183 plus numerous maps. Price $2.50.

**Gold Placer Deposits of the Pioneer District, Montana.** Bulletin 978-C. Pp. 99 plus map. Price 45¢.

**Geology and Ore Deposits of the Upper Blue River Area, Summit County, Colorado.** Bulletin 970. Pp. 74 plus maps. Price $1.75.

**The Cle Elum River Nickeliferous Iron Deposits, Kittitas County, Wash.** Report No. 978-B. Pp. 67 plus maps. Price $1.

**The Wallapai Mining District, Cerbat Mountains, Mohave County, Arizona.** Bulletin No. 978-E. Pp. 50 plus map. Price $1.

At the Trail, British Columbia, Lead and Zinc Mine, owned and operated by The Consolidated Mining and Smelting Co. of Canada, Ltd.

WITH THE **DIFFERENTIAL ROTARY DUMPER**

It's everyday procedure at this Canadian lead and zinc mine. A touch of the air control starts the dumping action and the law of gravity takes over. It's as simple as that!

Simplicity in design, speedy operation, low upkeep, safety, low initial cost and ease of erection . . . these are some of the reasons why you are seeing more and more single and multiple Differential Dumpers in the mining world.

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**SINCE 1915 — PIONEERS IN HAULAGE EQUIPMENT**

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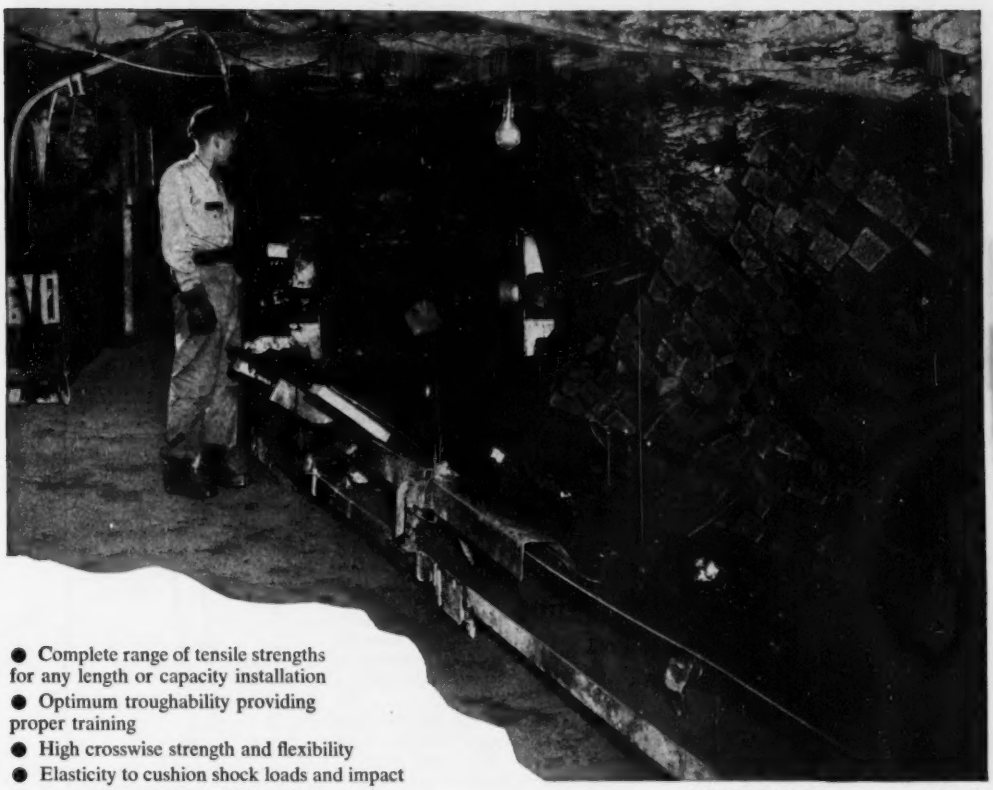

- Complete range of tensile strengths for any length or capacity installation
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- Skim between all plies for increased flex life over small underground pulleys
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U.S. Giant Underground Belts are obtainable at your nearest U.S. Rubber Mechanical Goods distributor or "U.S." factory branch.

**TRANSFER POINT** between two 30" 4 ply Style XN U.S. Giant Conveyor Belts. Style XN is a patented construction of cotton and Nylon carcass embodying greater strength and crosswise flexibility at no increase in weight over conventional type belts. More than 15,000 ft. of this belting is operating in this mine.

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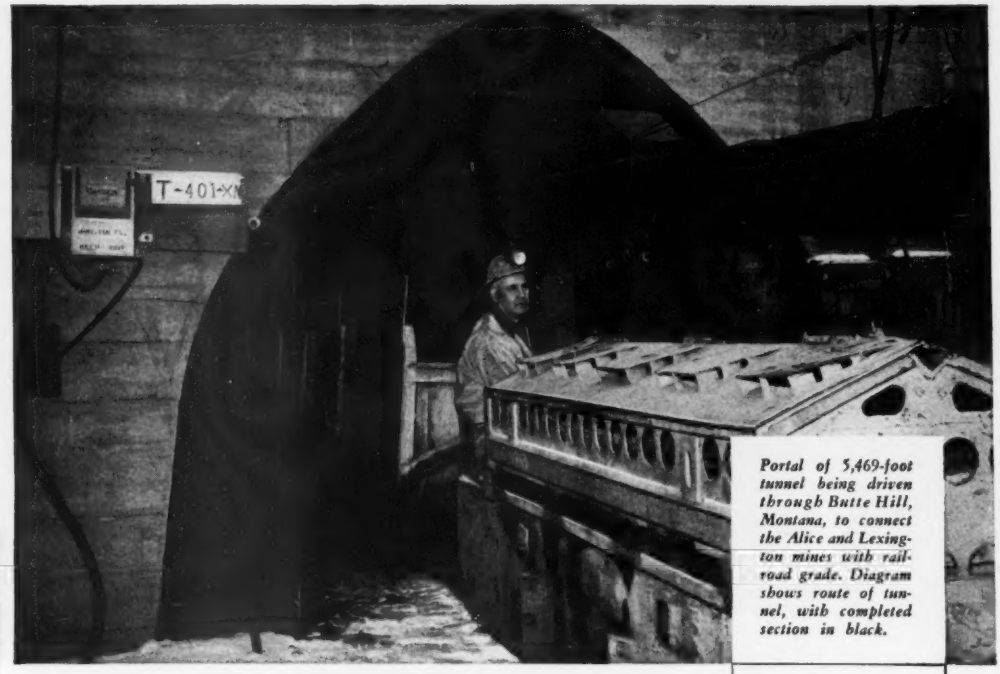



*Portal of 5,469-foot tunnel being driven through Butte Hill, Montana, to connect the Alice and Lexington mines with railroad grade. Diagram shows route of tunnel, with completed section in black.*

# Digging into YESTERDAY

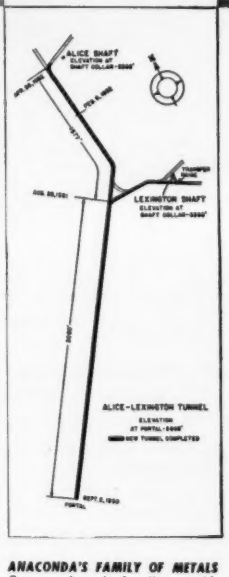
## for more ZINC today

Anaconda's historic Alice and Lexington mines on Butte Hill were rich in silver 75 years ago. Today they are being mined for their wealth of zinc—as part of Anaconda's program to increase the capacity to produce from the Company's own mines. The new tunnel, which is now nearing completion, links the two shafts to railroad grade and greatly facilitates the mining operation through improved ore handling.

To handle the increased ore production from the Butte district, the Company is expanding its concentrating and electrolytic plants at Great Falls and Anaconda, Montana. This expansion includes installation of additional crushing, milling and flotation equipment—added leaching units—and new Cottrell treaters to reduce dust losses at the zinc roasting furnaces.

In 1951, Anaconda turned out 62% of all electrolytic zinc—and 23% of all slab zinc—produced in the United States. Within the next few years, the Company's accelerated zinc program will increase Anaconda's mine output capacity by an estimated 50%.

This zinc story is just one part of Anaconda's continuing program of expansion, improvement and modernization—at mines, mills and fabricating plants. Today the program is producing more metal and finer metal for America's strength. Tomorrow it will mean better products and better living for America's people.




**ANACONDA'S FAMILY OF METALS**
Copper, zinc, lead, silver, gold, platinum, cadmium, vanadium, selenium, manganese ore, ferromanganese.

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The evidence of the Edison Lamp's ability to fill this illumination need with greater safety is provided by the army of users.

When you have a safety problem, M.S.A. is at your service. Our job is to help you.

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**Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.**
*At Your Service: 67 Branch Offices in the United States and Mexico*
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# WITH BATTERY POWER

Smooth flow of coal from face to tipple requires maximum shuttle car flexibility. Battery operated shuttle cars provide unlimited operations in moving coal underground. As independent units without trailing connections, battery cars can run around obstructed passageways, travel alternate routes to and from the loader, travel unusual distances when necessary, and, by permitting one-way travel systems, eliminate passing difficulties and speed up production. All this in addition to safety unequalled with any other type of power!

Gould's Plus-Performance Plan may be able to extend your battery power as much as 50%. It's free. Write Gould Battery Information Headquarters for details.

Gould "Thirty". America's Finest Mine Shuttle Car Battery

**GOULD** *Industrial Batteries*

**GOULD-NATIONAL BATTERIES, INC., TRENTON 7, N. J.**

*Always Use Gould-National Automobile and Truck Batteries*

*Detachable*

**ROK-BITS:**

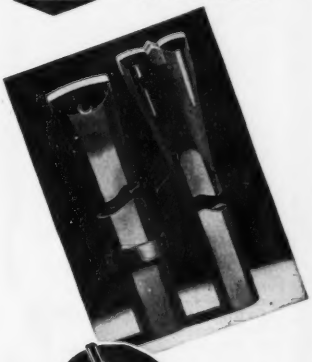
Chisel or 4-point—gauge sizes: 1⅜" to 4". Booklet gives details.

**Which do you prefer? ROCK BIT supplies both**

*Integral*

**INTRA-SET steel**

also carbide tipped. Chisel or 4-point—gauge sizes: 1⅜" to 2¼". Request folder.



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SALES AND SERVICE CO.

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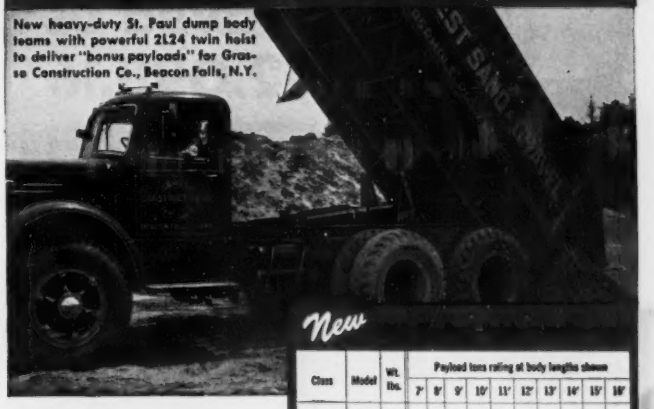
LONG HOLE DRILLING TOOLS • HOLE-SAVERS
ALL TYPES OF HOLLOW DRILL STEEL
ACCESSORIES FOR PNEUMATIC DRILLS

# COMPARE St. Paul's *Added Values!*



New heavy-duty St. Paul dump body teams with powerful 2L24 twin hoist to deliver "bonus payloads" for Grasse Construction Co., Beacon Falls, N.Y.

*New*

| Class | Model | Wt. lbs. | Payload tons rating at body lengths shown | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 7' | 8' | 9' | 10' | 11' | 12' | 13' | 14' | 15' | 16' |
| Standard Duty 4 new models | D-16 | 550 | 7½ | 6 | | | | | | | | |
| | H-16 | 650 | | 9 | | | | | | | | |
| | H-18 | 735 | | | 9 | 8 | 7 | | | | | |
| | H-20 | 795 | | | 11½ | 10 | 9 | 8 | | | | |
| Heavy Duty 5 new models | L-20 | 870 | | | 14 | 12½ | 11 | 10 | 9 | | | |
| | L-24 | 1020 | | | | 15 | 13½ | 12 | 11 | 10 | | |
| | 2H20 | 1370 | | | | 20 | 18 | 16 | 14½ | 13 | 11½ | |
| | 2L20 | 1555 | | | | 25 | 22 | 20 | 18 | 16½ | 15 | 13½ |
| | 2L24 | 1695 | | | | 31 | 28 | 25 | 23 | 21 | 19 | 17 |

Note: 6 new conversion hoists for platforms also available.

**Up to 22% more payload capacity per dollar!**

**15 to 50% lower mounting costs!**

**Up to 300 lbs. less dead weight per unit!**

**Tear out this ad . . . use it to compare St. Paul's new "bonus capacities" with any other hoist on the market. You'll find St. Paul gives you *far more payload capacity per dollar of cost — at all body lengths!***

**You'll also get more miles of smooth, trouble-free service — thanks to St. Paul's exclusive new uni-flex sub-frame, with full-floating tension rods, equi-lift strut arms and improved friction-free hydraulic system. See these great new 6 to 31-ton capacity St. Paul hoists and dump bodies at your St. Paul Distributor today — or mail coupon below for free literature.**

**St. Paul**
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**ST. PAUL HYDRAULIC HOIST**
*Customer Service Department*
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Send free booklet describing new St. Paul hoists and bodies.

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S-HDC-6

# This Lubricant saved us $2,098.16"

"During the seven month period before using LUBRIPLATE No. 130AA in the bearings of our Kraft Mill Lime Kiln, we used a conventional oil of the density recommended. The cost of the lubricant for the period was $2,134.00. In the seven months that followed, we only used 128 lbs. of LUBRIPLATE No. 130AA for initial filling and replacement at the cost of $35.84. LUBRIPLATE No. 130AA only requires weekly applications whereas the former lubricant required daily application."

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The Brown Company is a progressive organization that is continuously seeking ways to improve their products, their methods and to cut costs. Naturally, when they found LUBRIPLATE No. 130AA, a grease type lubricant with great adhesive qualities, high film strength, and with high heat resistance, they saw the possibility of using it to their advantage in the bearings of their kilns and other equipment.

LUBRIPLATE Lubricants are available from the lightest fluids to the heaviest density greases. They reduce friction, wear and power consumption, they prevent rust and corrosion, they last much longer than ordinary lubricants. There is a LUBRIPLATE Lubricant that is best for every lubrication requirement. Let us send you information about the use of LUBRIPLATE Lubricants in your industry. *Write today.*

**LUBRIPLATE DIVISION**—Fiske Brothers Refining Company, Newark 5, N. J., Toledo 5, Ohio.

***DEALERS EVERYWHERE—CONSULT YOUR CLASSIFIED TELEPHONE BOOK***

# LUBRIPLATE *THE MODERN LUBRICANT*

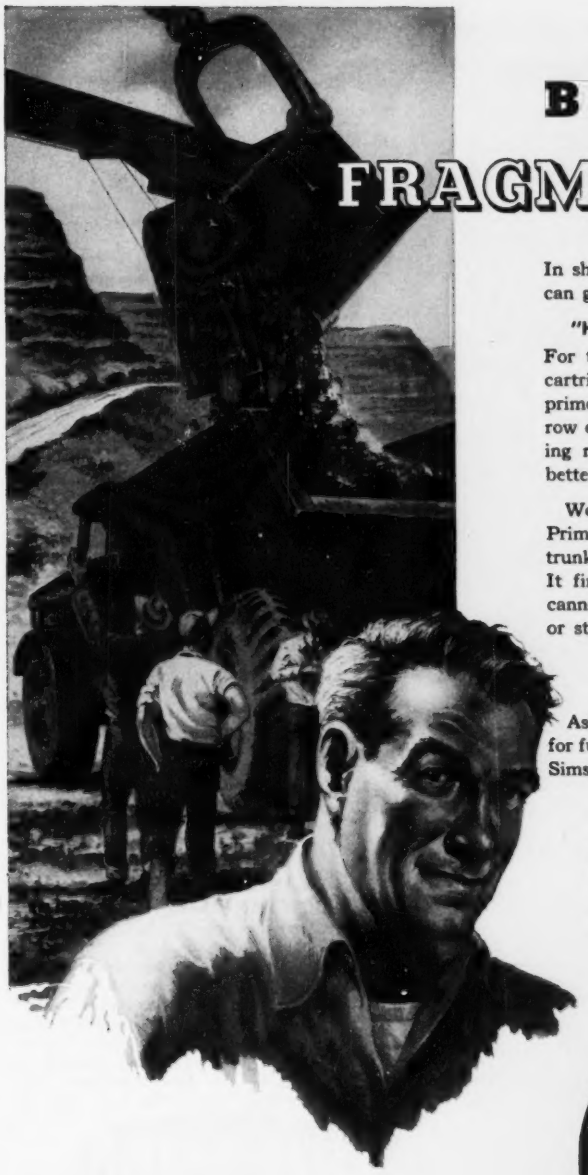
# Makes tubing installation a SNAP!

In just 10 seconds this patented snap-on coupling joins lengths of flexible ventilation tubing. And, only Mine-Vent Tubing has it! Faster coupling and easy hanging of Mine-Vent means fresh air always *where and when you need it* . . . at the face, immediately after blasting . . . a constant supply of fresh air to keep working energies at peak capacity. For new ventilation efficiency — lower production costs — write your needs to **AMERICAN BRATTICE CLOTH CORP., 220 Buffalo St., Warsaw, Indiana**

**"Canned" for your convenience**

*Durable, easy-to-handle fiber drums keeps MineVent in perfect condition until you need it*

# MineVent Tubing



# BETTER FRAGMENTATION

In shooting for pay loads, you will find that you can get better fragmentation if you

**"Hook up and Detonate with PRIMACORD"**

For two good reasons: 1) Primacord fires every cartridge in every hole with the added force of a primer cartridge. 2) By proper hook up the front row of holes will go a split second before succeeding rows, thus relieving burden and resulting in better fragmentation.

Wound on light weight spools, easily carried, Primacord is easy to handle on the job. Use it for trunk line hook ups and down hole branch lines. It fires instantaneously from a blasting cap yet cannot be set off by friction, sparks, ordinary shock or stray currents.

***To keep those trucks rolling keep PRIMACORD unrolling***

Ask your explosives supplier or write us direct for further facts. The Ensign-Bickford Company, Simsbury, Connecticut.

*Also Safety Fuse since 1836*

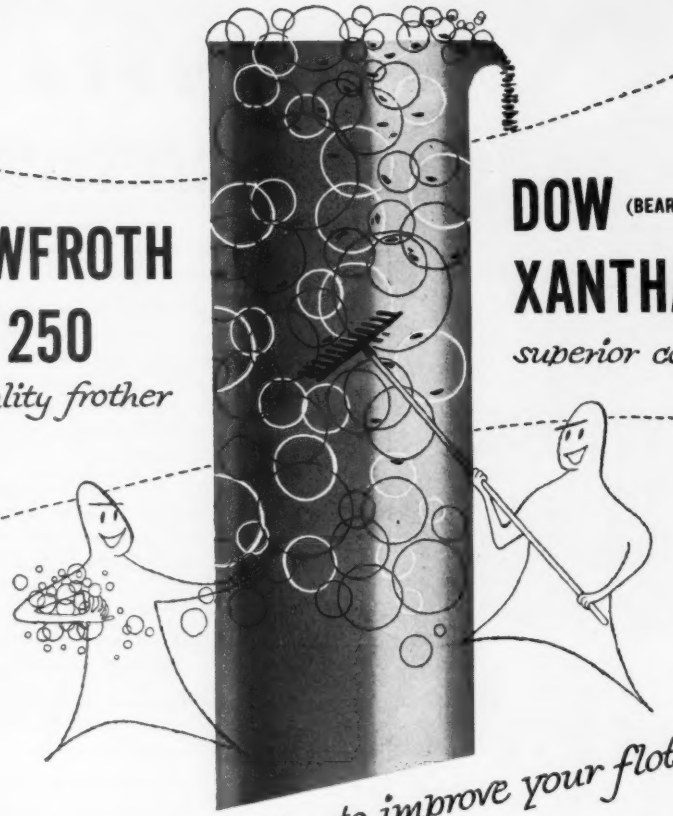
**There's a type for every job. PLAIN PRIMACORD for shallow holes and surface trunk lines; REINFORCED PRIMACORD for deep holes and resistance to abrasion; WIRE COUNTERED PRIMACORD for deep, ragged holes; and PLASTIC REINFORCED PRIMACORD for deep holes and unusual wet conditions.**

## Use PRIMACORD®

## The PROVED and APPROVED DETONATING FUSE

# DOWFROTH 250

*a quality frother*



# DOW (BEAR BRAND) XANTHATES

*superior collectors*

*an effective combination to improve your flotation!*

**DOWFROTH 250**—An economical frother, Dowfroth 250 in actual mill tests has demonstrated *excellent* frothing characteristics with *one-fourth of normal concentrations!* It produces a livelier froth on the machine, quicker breaking in the launders and pump boxes, and more effective mineral recovery. Having little or no collecting power, Dowfroth 250 offers the advantage of independent regulation of frother and collector for good control. Try Dowfroth 250—write to Dept. OC 29 for your *free* mill-test sample!

**DOW XANTHATES**—For greatest efficiency and economy in the separation of sulfide minerals, Dow xanthates are unexcelled! These uniform quality collector reagents give greater concentration and maximum recovery. To allow extreme selectivity, Dow offers a wide range of xanthates—all possessing good collector power. For more detailed information on Dow xanthates and what they will do for you, write to Dept. OC 29.

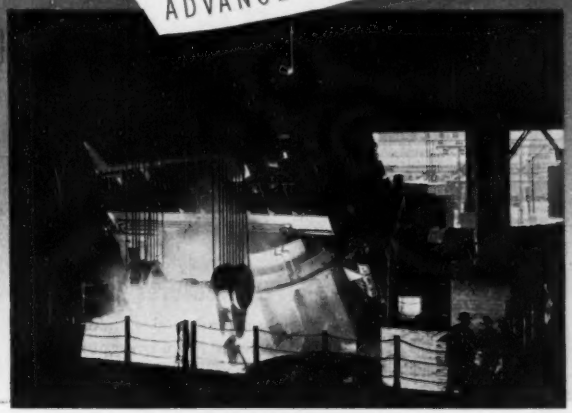
**THE DOW CHEMICAL COMPANY**
**MIDLAND, MICHIGAN**

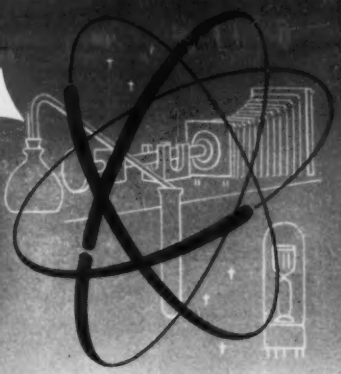
**DOW**
**CHEMICALS**
**INDISPENSABLE TO INDUSTRY AND AGRICULTURE**

# Steel

BULWARK OF FREEDOM AND...

LABORATORY FOR THE ADVANCEMENT OF QUALITY





***Another Electric Furnace Increases Sheffield Steel Making Capacity***
**At both the Houston and Kansas City Sheffield steel mills, ultra modern electric furnaces supplement the many open hearth furnaces in making Sheffield Steel. Also added to Sheffield's steel making facilities is a new and modern laboratory.**

Steel enters into every product. Steel is either a part of the product or is used in its production—or both.

Advancement of quality in many products very often must begin in the steel maker's laboratory.

At Sheffield Steel Mills is the most versatile metallurgical laboratory West of the Mississippi and East of the Rockies. It is complete with chemical and physical equipment. Its technical staff continuously searches for improved formulae for a wide diversity of steels and for better processes of heat treatments under automatic pyrometric control.

Then, from raw materials to finished steel, samples are micro and macro etched and photographed for metallurgical observation of porosity, grain structure and faults. The physical laboratory constantly runs impact, fatigue, tensile and hardness tests including stress-strain diagrams.

And, Sheffield's advancement of quality to higher and higher levels goes beyond this. Inspection data is analyzed at every step of manufacture by statistical methods. Thus statistical quality control quickly points out the slightest variation from the high uniform level prescribed.

**SHEFFIELD**
**STEEL**
**CORPORATION**
HOUSTON KANSAS CITY
TULSA
SUBSIDIARY OF ARMCO STEEL CORPORATION

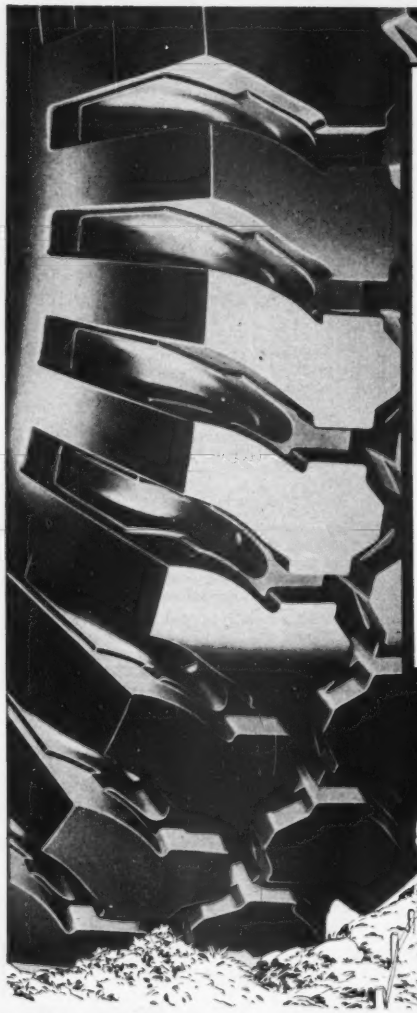
**SHEFFIELD**
**MOLY-COP**
COPPER-MOLYBDENUM ALLOY
*Grinding Balls*
USED and PROVED ALL AROUND THE WORLD

IRON AND STEEL *SCRAP* MEANS.....

**MORE STEEL FOR AMERICA**
*More Money In Your Pocket!*

*GET YOURS OFF TO*
THE DEFENSE LINES NOW!

# U.S. ROYAL
## FLEETMASTER Truck Tire



### On and off the road—Speeds Both Jobs!

Drive it through mud, sand, rocks—watch it grip and hold. Pull up on the highway—feel its smooth, long-wearing roll. Only the Fleetmaster does both jobs so well—the tire *specialized* for top performance on and off the road!

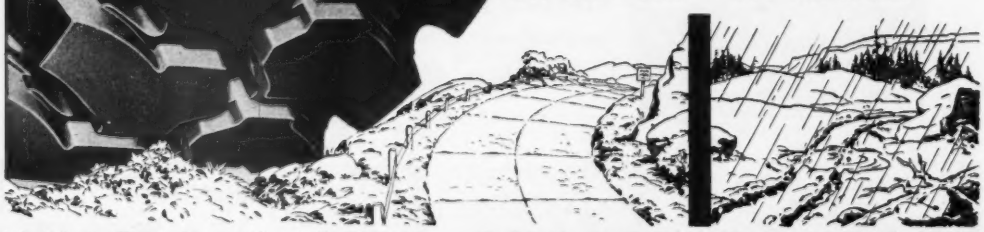
**Put these JOB-FITTED features to work!**

- **More miles—70% deeper tread, thicker undertread!**
- **More cut-resistance—special tread compounds!**
- **More recaps—tougher, stronger carcass!**
- **Less distortion strain—new round-molded form!**

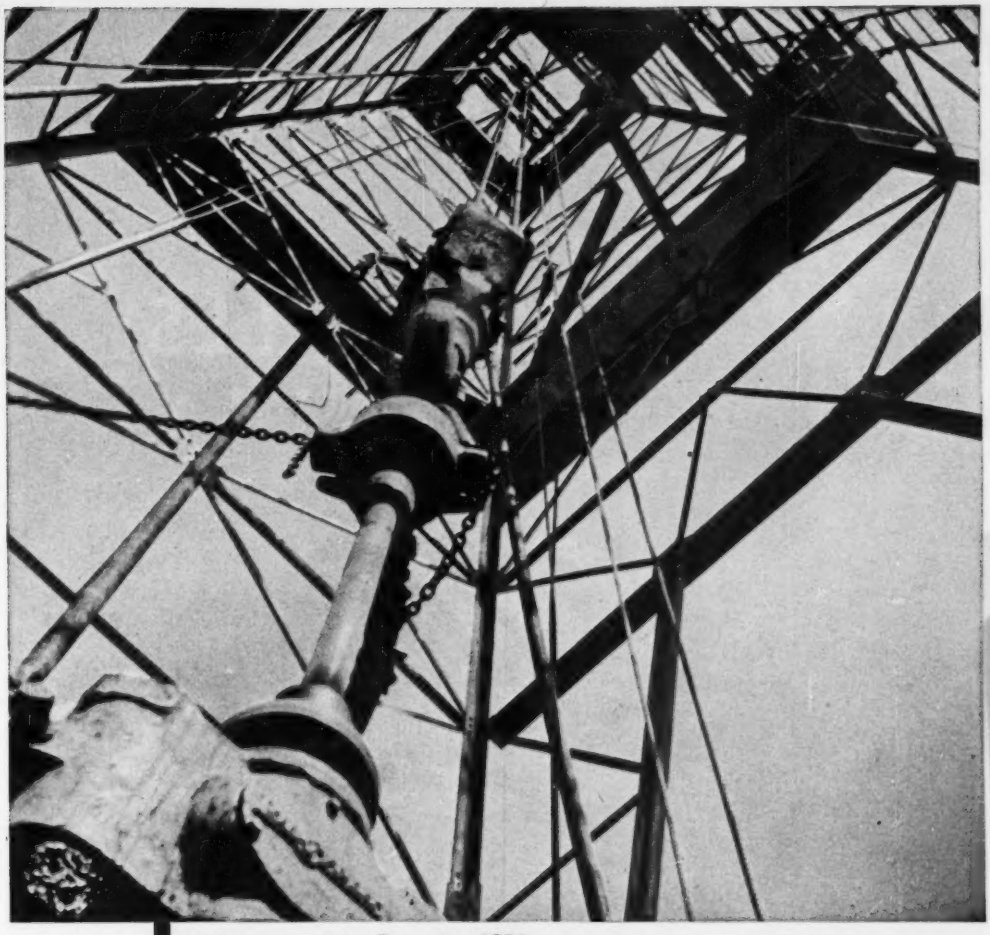
**See and Compare** at your U. S. Royal Dealer's. His complete U. S. Royal line—his cost-cutting Fleet Service Plan can mean large savings to you. Phone him today—he's in the Classified Telephone Book.

**SEE ONE TIRE DO TWO JOBS**

**ON THE ROAD** **OFF THE ROAD**



**UNITED STATES RUBBER COMPANY**



*. . . Cores Tell The Story*

# Deep Hole Drilling . . .

with speed and economy is provided by Longyear Contract Drilling Service. Rapid drilling progress is obtained by modern equipment like this new Longyear deep hole drill. Maximum core recovery is assured by skilled Longyear crews experienced in recovering cores from all types of formations.

Whatever your drilling needs—deep hole or shallow with a "turn-key" job—Longyear Contract Drilling Service will satisfy them quickly and economically.

Write today for complete information without obligation.

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**The Longyear DH-5 deep hole drilling rig is now available to purchasers who prefer to do their own drilling. Write for New Bulletin.**

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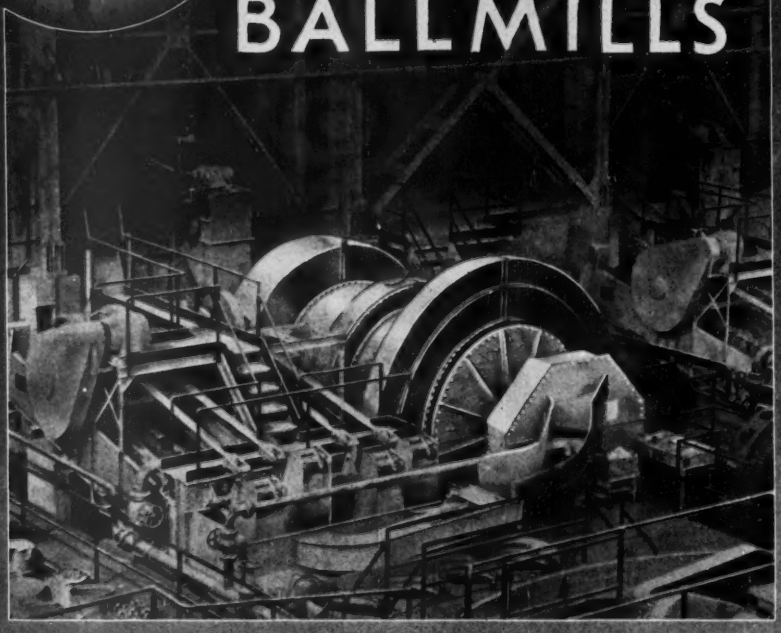
CANADIAN LONGYEAR, LIMITED, NORTH BAY, ONTARIO, CANADA

DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS

# SMIDTH

## BALLMILLS



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OPEN OR CLOSED CIRCUIT

ALSO AIR SWEPT FOR GRINDING AND DRYING

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# THE IMPROVED
# Exide-Ironclad
## BATTERY

**OUTSTANDING NEW FEATURES INCLUDING**

the polyethylene insulating tube sealer combine to make Exide-Ironclad, *more than ever before*, YOUR BEST POWER BUY . . . AT ANY PRICE.

**THE IMPROVED EXIDE-IRONCLAD IS BUILT TO GIVE YOU . . .**

**RAPID, HIGH PRODUCTION HAULAGE, more trips per shift . . . HIGH MAINTAINED VOLTAGE, with uniform speed to end of shift . . . HIGH AVAILABILITY . . . LOW OPERATING COSTS . . . LOW MAINTENANCE COSTS . . . LOW DEPRECIATION COSTS . . . SAFETY from hazards of fire and fumes.**

**BECAUSE OF . . .**

IMPROVED POSITIVE PLATE CONSTRUCTION. The long-life grids now contain SILVIUM—an alloy of silver, lead and other components—which make them highly corrosion resistant.

. . . the New Polyethylene insulating tube sealer of acid-proof, non-corroding plastic. It fits snugly into slotted tubes of positive plate, and reduces loss of active material. Even the small sediment deposit of the past is reduced 50%. Thus more active material remains available, and the high battery capacity is maintained for a longer working life.

**IMPROVED NEGATIVE PLATES** for higher electrical efficiency.
**NEW SEALING COMPOUND**—provides permanent seal between jar and cover.
**SEAMLESS SHOCK-PROOF JAR**, of high quality rubber combines tensile strength and elongation for long-life and heavy-duty service.
**NEW UNBREAKABLE PLASTIC VENT PLUGS** of polyethylene.
**TYPES, SIZES AND CAPACITIES** for mine haulage units of every make.

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"EXIDE-IRONCLAD" and "SILVIUM" *Reg. T.M. U.S. Pat. Off.*

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1952 Mining Show
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Exide-Ironclad
IS YOUR BEST POWER BUY —
. . . AT ANY PRICE

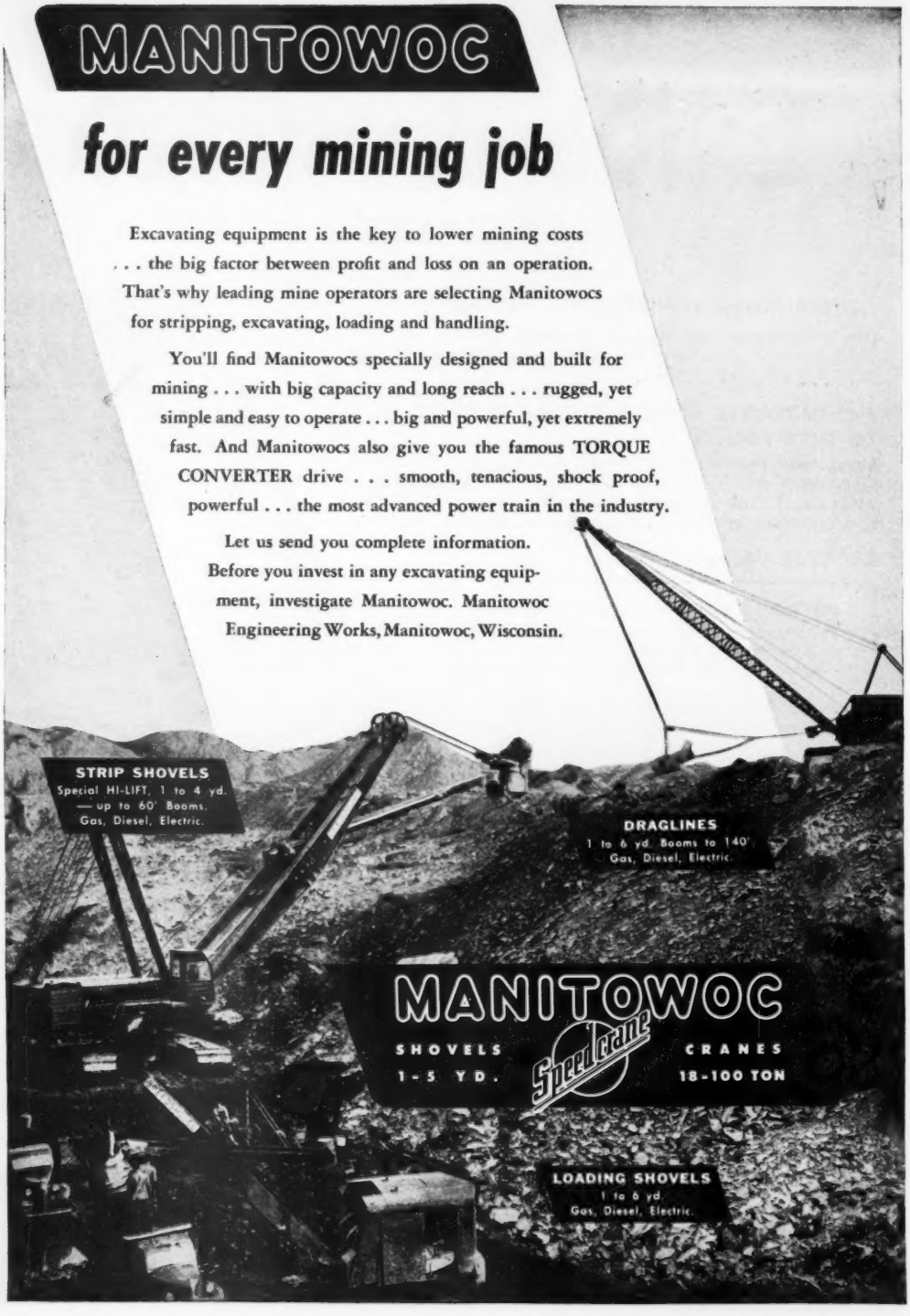
# MANITOWOC

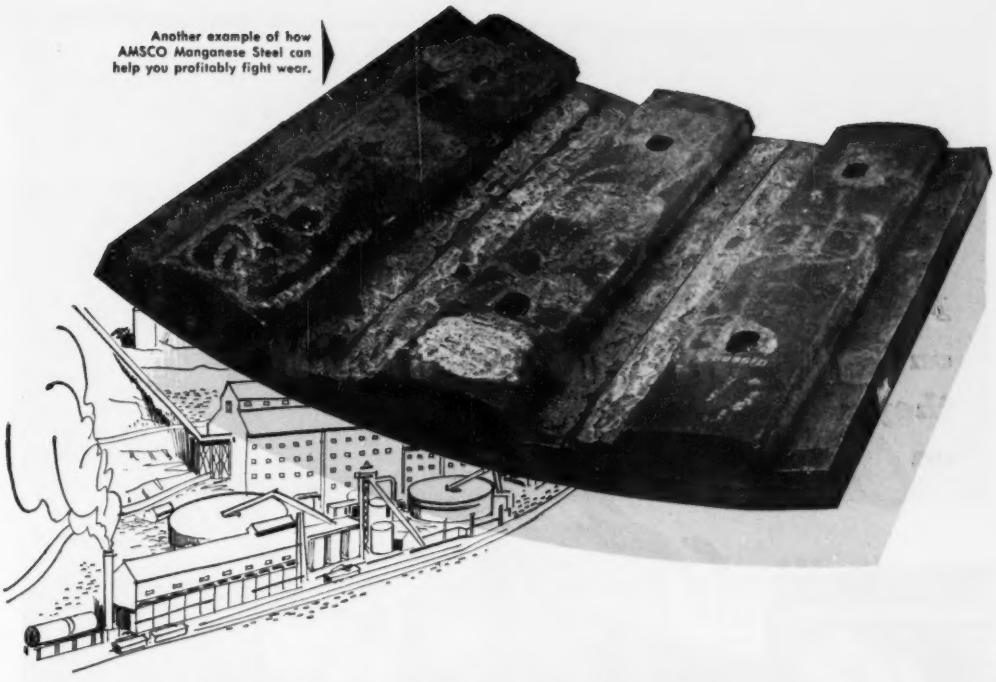
## for every mining job

Excavating equipment is the key to lower mining costs . . . the big factor between profit and loss on an operation. That's why leading mine operators are selecting Manitowocs for stripping, excavating, loading and handling.

You'll find Manitowocs specially designed and built for mining . . . with big capacity and long reach . . . rugged, yet simple and easy to operate . . . big and powerful, yet extremely fast. And Manitowocs also give you the famous TORQUE CONVERTER drive . . . smooth, tenacious, shock proof, powerful . . . the most advanced power train in the industry.

Let us send you complete information. Before you invest in any excavating equipment, investigate Manitowoc. Manitowoc Engineering Works, Manitowoc, Wisconsin.






# These LINERS lasted 6 times longer

## How AMSCO Manganese Steel increased production . . . lowered costs per ton

A large Western mine had a problem that's all too common . . . Rod Mill Liners that lasted approximately 100,000 tons before an expensive replacement job was necessary.

In July of 1949 something new was tried. This mine installed AMSCO Liners equipped with a specially designed renewable lifter. Result? The AMSCO Liners milled 640,208 tons . . . over 6 times the tonnage of the liners formerly used. There were two important reasons for this tremendous increase in service life:

**1.** The liners were made of AMSCO Manganese Steel, the toughest steel known for high resistance to abrasion and impact.

**2.** The overlapping type AMSCO Renewable Lifters took the brunt of the load—reduced the need for replacing the more expensive liners. The lifters alone milled 340,322 tons . . . over 3 times more than the old installation!

**WHEREVER YOU MEET A PROBLEM OF WEAR CAUSED BY IMPACT AND/OR ABRASION . . .**

. . . find out about longer-lasting, dollar saving Manganese Steel made by AMSCO . . . world's largest producer of Manganese Steel Castings for all industry.

AMSCO controls impact and abrasive wear in 5 basic industrial operations:

Power Transmission

Mining and Excavating

Transportation

Crushing and Pulverizing

Materials Handling

AMERICAN Brake Shoe COMPANY

**AMERICAN MANGANESE STEEL DIVISION**

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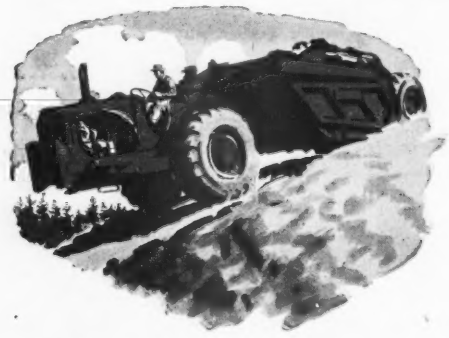
Other Plants: New Castle, Del., Denver, Oakland, Cal., Los Angeles, St. Louis. In Canada: Joliette Steel Division, Joliette, Que. Amsco Welding Products distributed in Canada by Canadian Liquid Air Co., Ltd.

***Men who depend on power...know they can depend on CUMMINS®***

## *Every CUMMINS DIESEL is built not once but twice*



Miners have learned to count on Cummins Diesels for dependable power day in, day out.

What's behind this consistent reliability? One good reason is the fact that every Cummins Diesel is actually built *twice*. After initial assembly, and run-in testing, every engine is disassembled, inspected; then reassembled and tested again.

This extra care—together with Cummins' economy-proved fuel system and efficient parts and service organization—makes lightweight, high-speed (50-550 h.p.) Cummins Diesels a wise first choice *for men who depend on power.*

Whatever your power needs . . . whether it's for stripping or hauling, portable power units or generator sets—or any other important jobs . . . your Cummins dealer is the man to see.

**CUMMINS ENGINE COMPANY, INC.,** Columbus, Indiana

*Export:* Cummins Diesel Export Corporation
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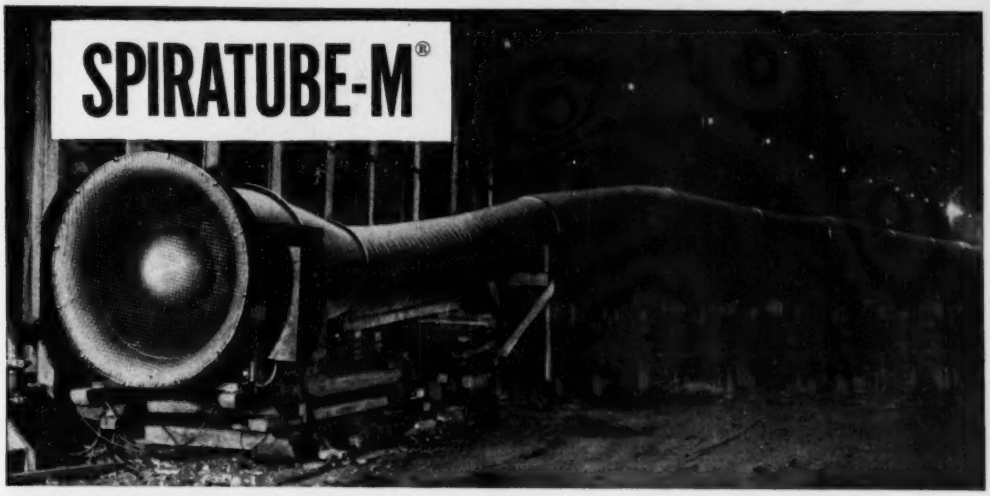
(N-66)

CUMMINS Diesel

TRADEMARK REG. U. S. PAT. OFF.

***Leaders** in lightweight, high-speed diesel power!*




# Simplify mine and tunnel ventilation

Here's the airduct that can take it! Now you can deliver air to the working face of mine or tunnel — cheaper! That's because SPIRATUBE-M is built to cut maintenance costs! Ease of handling reduces installation costs. Unique SPIRATUBE-M construction features minimize leaks and seepage. And you get the maximum efficiency of your blower or fan . . . cutting power costs!

Immediately available in diameters to 30 inches, from fully-stocked distributors, SPIRATUBE-M is made in tough high count fabrics, all specially treated and heavily coated inside and out to withstand fungus, mildew and rough treatment.

And, patented, *built-in*, quick-couplers eliminate the need for separate parts . . . no need to look for couplers when you're in a hurry.

For heavy duty, pressure ventilation tubing without wire reinforcement, ask for AYRTUBE®. Sold in diameters to 36", AYRTUBE by itself or in combination with SPIRATUBE-M offers you an inexpensive airducting.

## *Check these features:*

**Handling ease**

**Lightweight**

**Flexible**

**Easily installed by you**

**Takes sharp turns without crimping**

**Withstands fungus, mildew, rough treatment**

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FREE BOOKLET DESCRIBES SPIRATUBE-M and AYRTUBE MINING AND CONSTRUCTION APPLICATIONS. Write for your copy today.

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*Tough, flexible Hazacord® Twin Type G. Note the mold-cured Hazaprene ZBF Sheath that forms a flame-resistant barrier between the power and grounding conductors and prevents short-circuiting.*

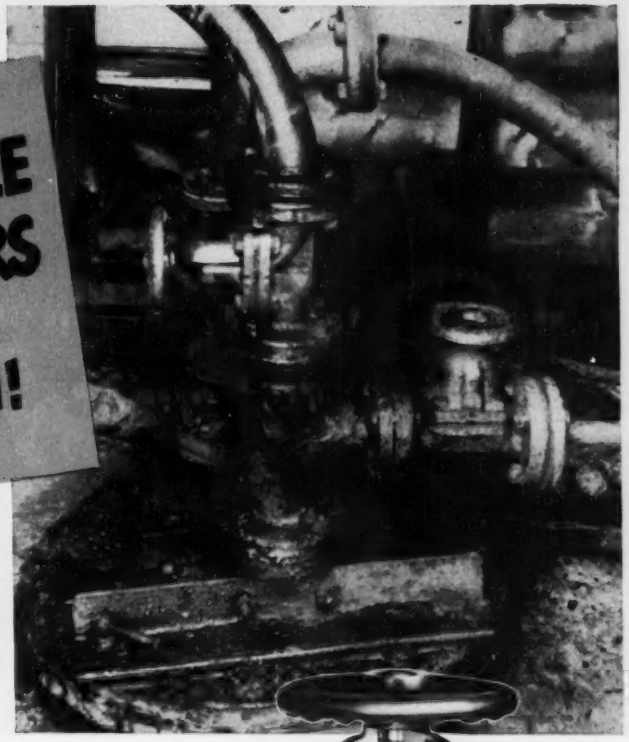
In the rough and tough mining industry, it takes real men to operate the heavy-duty equipment . . . and rugged cable to keep it on the job.

Engineered throughout for this tough service, Hazacord® Twin mining cable has the stamina to stand up under the many punishing conditions of underground work. The tough Hazaprene ZBF Sheath — vulcanized under pressure in a metal mold — has the smooth finish, density, resistance to flame, moisture and abrasion required for safety and long life. The separately insulated conductors are each reinforced with a moisture-resistant, non-rotting open braid which locks conductors and sheath into one integral mass and prevents internal slipping. Yet, with all this protection, Hazacord mining machine cable has the flexibility that adds years of extra life.

Hazacord mining machine cable is certified as flame resistant by the U. S. Bureau of Mines and the Pennsylvania Department of Mines—look for "P-104BM" molded into the sheath. For full information on the complete line of Hazacord portable cables and flexible cords used by the mining industry, write Hazard Insulated Wire Works, Division of The Okonite Company, Wilkes-Barre, Pennsylvania.

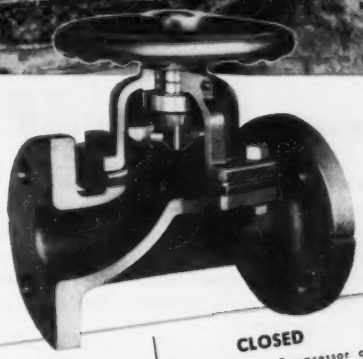
**HAZACORD** *Mold-Cured* **portable cables**

# TROUBLE FREE FOR 15 YEARS handling muriatic acid!



*Another 'open and closed' case for*

# GRINNELL-SAUNDERS DIAPHRAGM VALVES

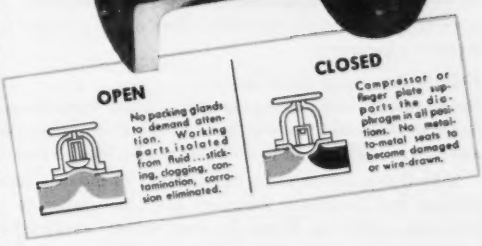


In 1936, a Canadian mine installed Saunders Diaphragm Valves with rubber linings on the feed and drain piping of an underground tank used for the storage of muriatic acid. Today, after 15 years, those *same* valves are in use—having required no maintenance except for periodic replacement of diaphragms, a simple operation done without removing the valve from the line.

Grinnell-Saunders Diaphragm Valves are available in many different combinations. Bodies are made in a variety of metals —iron, stainless steel, bronze, aluminum and others. ***But of more importance*** is the fact that a body of cast iron (a metal not in short supply) can be lined with glass, lead, natural rubber, neoprene and other materials which, in many instances, handle corrosive fluids ***better*** than metals.

Diaphragms come in natural rubber, neoprene, butyl, hycar, a special synthetic for foods and KEL-F. This last is chemically inert to all acids and alkalies in all concentrations with the exception of molten alkali metals.

From this broad selection of materials, the problems which the Grinnell-Saunders valve can solve are extremely varied. No wonder industry after industry is putting it on the line.

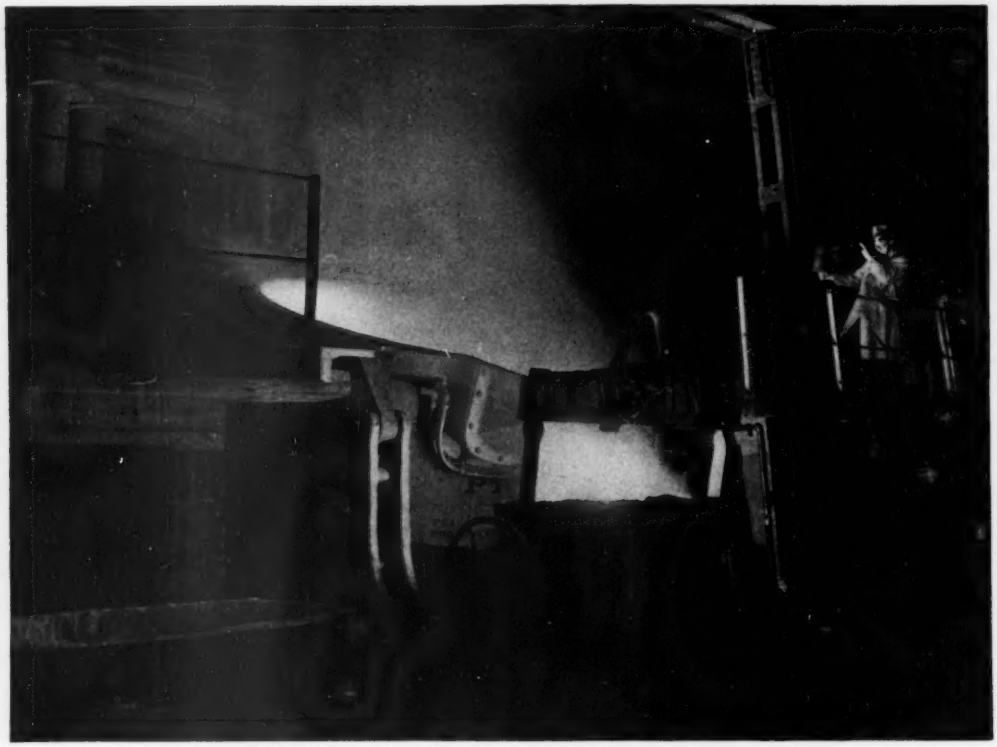

OPEN
No packing glands to demand attention. Working parts isolated from fluid ... sticking, clogging, contamination, corrosion eliminated.
CLOSED
Compressor or finger plate supports the diaphragm in all positions. No metal-to-metal seats to become damaged or wire-drawn.

# GRINNELL

**WHENEVER PIPING IS INVOLVED**

**Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors**

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems



# Non-metallic melting? LECTROMELT* has the answers!

*Designed to solve your production problems—*

For smelting and refining operations, so many variables enter into each problem that Lectromelt plans your furnace or furnace components to meet specific requirements. Electrode controls, for example, are designed for the individual installation. Automatically or manually operated, they make possible finely accurate adjustments.

*Built to keep you in production—*

Because they're built for long, low-cost operation. Rugged construction is combined with micro-accurate control. Electrical equipment and substations are built to withstand tremendous overloads.

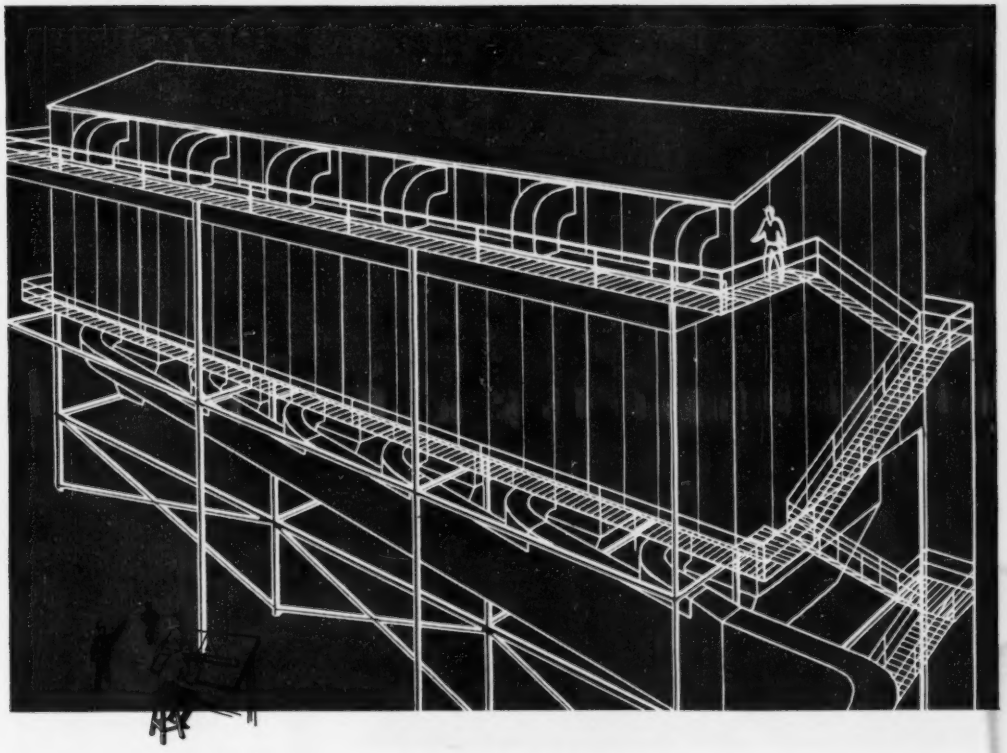
More than a million and a half kilowatts of installed capacity promise that Lectromelt engineers have the answer to your smelting problems. Write for our booklet to Pittsburgh Lectromelt Corporation, 222 32nd Street, Pittsburgh 30, Penna.

*Write for your free copy* of Lectromelt's booklet, "Moore Rapid Lectromelt Furnaces for Smelting and Refining Operations."

*REG. T. M. U. S. PAT. OFF.

MOORE RAPID

WHEN YOU MELT... *Lectromelt*



# DUSTUBE . . . custom designed

## for the mining and metallurgical industry

Dustube Collectors are individually designed for the rigorous dust and fume applications of the mining and metallurgical industry. They have the inherent capacity for continuous, severe service at high filtration efficiency, with a minimum of down time for maintenance. Uniform recoveries approaching 100% are commonplace. Hot and/or corrosive gases are efficiently handled through the use of synthetic filtration fabrics. Automatic units can be designed to permit interior inspection and maintenance of the Dustube without shutting down.

Dustubes can be custom designed to readily fit existing or new plant buildings, flue lines and ground contours. Various arrangements of hoppers and hopper discharge mechanisms are available — including steep-sloped pyramid hoppers with rotary, double-dribble or slide gate valves; trough type hoppers with screw conveyors, or flat-bottom hoppers with built-in scraper conveyors.

All collected fume or dust is automatically conveyed to one central point, thus eliminating expensive hand labor in handling valuable by-products. Collected materials may be reprocessed without dewatering, filtering or drying.

Our engineers are at your service to assist you in your filtration problems. It will pay you to investigate the many advantages of Dustube Collectors. *Write for complete information today.*

**TYPICAL APPLICATIONS**

**Lead blast furnace gases**
**Zinc fuming retorts and sinter fumes**
**Electric melting furnace fumes**
**Reverberatory lead furnace fumes**
**Dwight-Lloyd sinter fumes**
**Filtration of furnace gases**

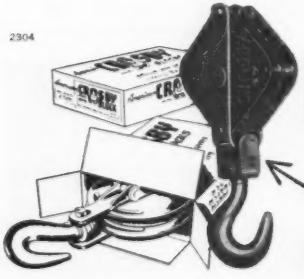
American dustube
WHEELABRATOR & EQUIPMENT CORP.
COLLECTORS

# What's the capacity of this block?

## If you don't know.. *don't use it!*

There's no place for guess-work in wire-rope lifting. Imagine the damage and expense involved if a hook straightened or a pin sheared, and this car suddenly dropped! And there's no guess-work to it when you're using American CROSBY Wire Rope blocks. Each American CROSBY block is LOAD-RATED—safe working capacity embossed in the side plate. That means *lifetime* protection . . . assurance of terrific strength throughout the block . . . extra-thick side plates, over-size pins and axles, sturdy, drop-forged hooks and heavy stiffening straps. Buy American CROSBY Wire Rope blocks, in sealed cartons, from your distributor or supply house. Made by the makers of genuine CROSBY Clips . . . American Hoist and Derrick Company, St. Paul 1, Minnesota.

2304



**American CROSBY**

*Load-Rated!*

**WIRE ROPE BLOCKS**

---

**WILLSON**

protection for industrial workers

**keep on the safe side**

**wear WILLSON GOGGLES**

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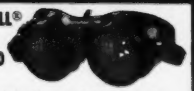

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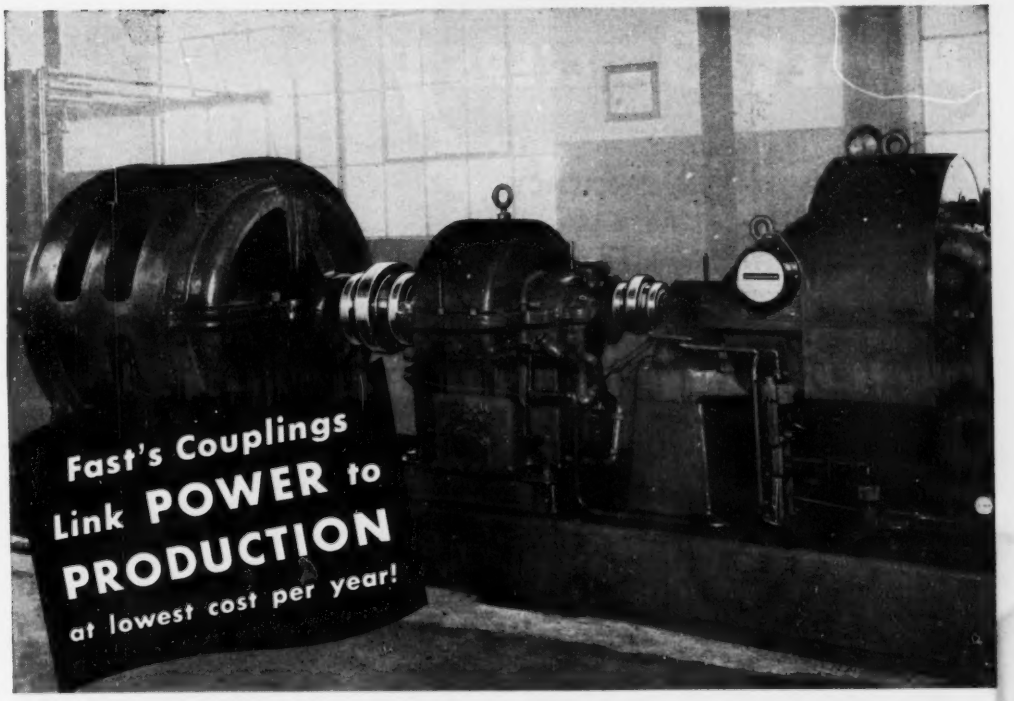


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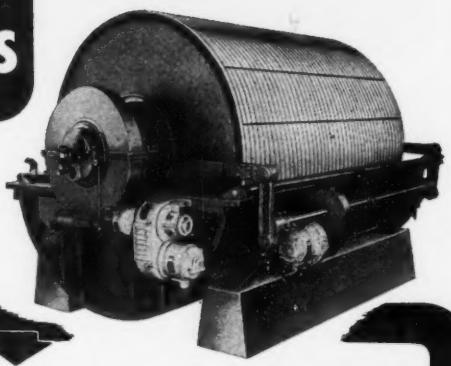

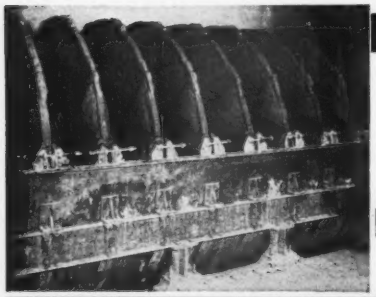

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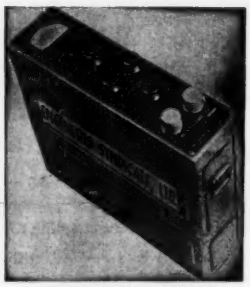

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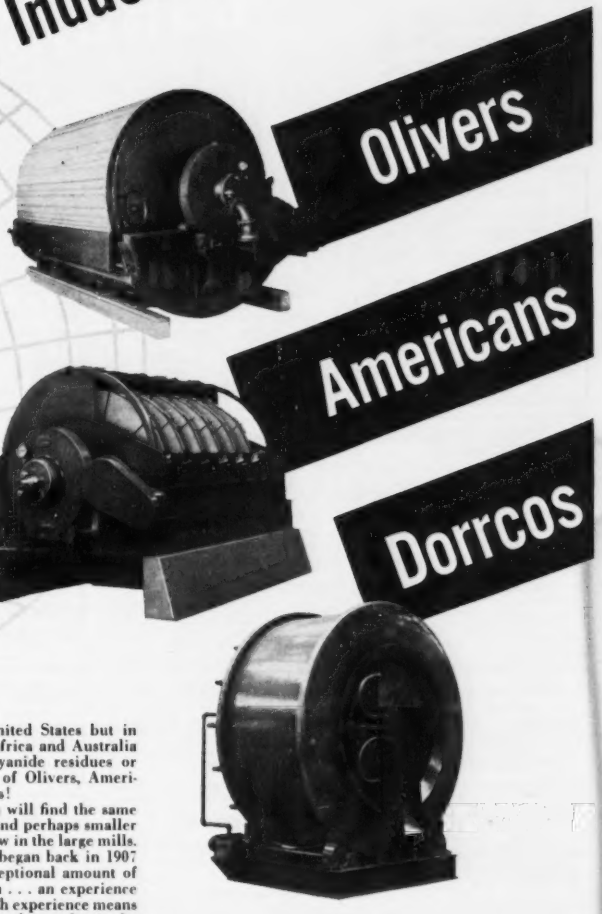


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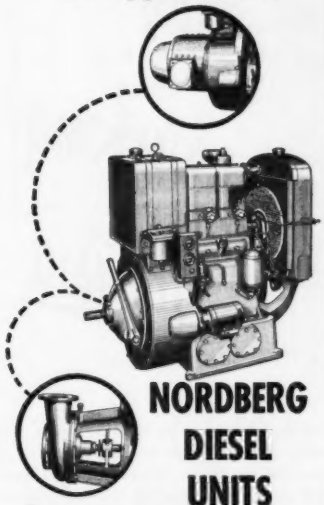

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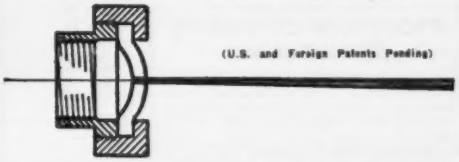

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- An improvement over the other impregnated bit we tried.
- . . . the best bits used thus far on our drilling at – –
- Cut the *highest footage* obtained by any bit on this job!
- Our records indicate a pretty good margin in favor of your bits.
- The first Ascolite bit you sent me worked fine . . . please send me six more . . .
- . . . greatly pleased . . . find them more serviceable than other pre-set bits tried.
- . . . drilled over 500 feet in ground where the average for hand-set bits is 110 feet . . .
- The bits were . . . unusually satisfactory and it is desired to obtain four new bits like them.
- . . . shows a considerable saving . . . over our own cast-set bit . . . we wish to have four more made up.
- *The letters containing the above comments are on file in our New York Office.*

Est. 1908 **ANTON Smit & CO., Inc.**

*Importers and Dealers • Carbons, Bortz, Ballas*
*Manufacturers of Diamond Tools*

333 W. 52nd St., New York 19, N. Y. Cables: PROFITABLE, New York

# SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • **OPPORTUNITIES** • EQUIPMENT—USED or RESALE

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*NEW ADVERTISEMENTS Address N. Y. Office, 330 W. 42nd St., N. Y. 36, N. Y. For September Issue closing August 21st.*

## PROFESSOR OF MINING ENGINEERING

To head Department of Mining Engineering and act as Associate Director of the Experiment Station. Desire man with both teaching and practical experience. Prefer education through Master's Degree. Salary commensurate with experience and general qualifications. Send letter of application including summary of education and experience to:

**W. E. Wilson, President**
South Dakota School of Mines and Technology
Rapid City, South Dakota

*REPLIES (Box No.): Address to office nearest you*
*NEW YORK: 330 W. 42 St. (36)*
*CHICAGO: 520 N. Michigan Ave. (11)*
*SAN FRANCISCO: 68 Post St. (4)*

### POSITION VACANT

METALLURGICAL ENGINEER with extensive plant design experience to take charge of design of an Antimony Oxidation and Reduction Plant. Location Pennsylvania. P-4796, Engineering & Mining Journal.

### POSITIONS WANTED

LATIN AMERICA — Manager — Mill superintendent—(54) E.M. Versatile, Mining, Milling, Exploration, Development, Layout & Organization, resourceful experienced Philippines, Central & South America, Mexico, Canada. U.S. excellent Credentials—speak Spanish. PW-4314, Engr. & Mining Jrl.

MINING ENGINEER, good qualifications, 8 years experience in mining, 5 years in design of mining and preparation equipment in large companies, actually in gold mining, with South American practice, appeals for position, $6,000 per year. PW-4853, Engineering & Mining Journal.

### BUSINESS OPPORTUNITIES

**New Ores Discovered in Wyoming**

One Telluride vein 7 ft. wide assaying $37.10 in gold to $49.70 in silver. Two Hornsilver veins, one 4 ft. 9 in., one 8 ft. Three Galena veins, one 2 ft. wide; one 4 in. and one 8 in. vein. All widths given frim outcrop on surface, assaying $200 up to $300; 22 to 120 oz. of silver, lead 80 to 86%. Require $150,000 for equipment and payroll. Only twi weeks work necessary to get tore in tunnels. Sixty miles to railroad. H. S. Hardee, 446 S. Linden Ave., Sheridan, Wyoming.

**Wanted Partner — Equal terms,**

to operate high grade Copper Mine, West Coast, Mexico. $10,000 handles. Clyde Smith—Rosario, Sinalor, Mexico.

### FOR SALE

Monazite lands in Valley County, Idaho, for sale or lease. Clara McMurdie, Cascade, Idaho.

**DO YOU REQUIRE A**
**MANAGER OR DIRECTOR**
**OF**
**OPERATIONS & EXPLORATIONS**
Excellent Record & References (Employed)
PW 4789, Engineering & Mining Journal
330 W. 42 St., New York 36, N. Y.

## ENGINEER

wanted for the installation and operation of a flotation plant in South America. Graduate engineer experienced in sulphur flotation with knowledge of Spanish preferred. State full details in first letter.

P-4824, Engineering & Mining Journal
330 West 42 St., New York 36, N. Y.

## RECONSTRUCTION FINANCE CORPORATION
## SEALED BID SALE
### INVITATION TO BID FOR
### Mica Processing Plant in Warren, New Hampshire
### IMMEDIATE POSSESSION

Reconstruction Finance Corporation invites bids for the purchase of property formerly occupied by White Mountain Mining and Milling Company, consisting of approximately 85 acres of land (with water rights and water supply) in Warren, New Hampshire, together with buildings thereon and machinery and equipment therein, located approximately one mile from the center of the town. The plant has a railroad siding.

Machinery and equipment at the plant was formerly used in extracting mica from schist but may also be used in place, for other purposes. A substantial portion of the machinery was purchased and installed new in 1949 and 1950. Bids will be considered for the property in its entirety only (both real and personal combined).

Prospective bidders may inspect the property on site from July 28 through July 30, 1952, or at other times by special arrangement.

Anyone interested in the purchase of this property may obtain bidding forms and a statement of terms and conditions relating thereto and a listing of the personalty at the Boston Agency of RFC, 50 Congress Street, Boston 9, Massachusetts.

Bids for the property will be considered only if made in accordance with and subject to the terms and conditions set forth in said statement. All bids must be presented at the aforesaid Boston Agency of FRC by 2:00 P.M., Eastern Daylight Saving Time, on August 15 1952.

**SURFACE MINING CONTRACTS WANTED**

Contractor desires contracts, no share or percentage proposals, for open pit mining and surface development including access roads in Western United States. Have modern machinery and experienced personnel.

**J. HENRY HARRIS**
2657—9th St., Berkeley 10, Calif.

## OPEN PIT MINING

Contractor with excellent equipment and experienced personnel interested in excavating, material handling, or open pit mining work.

**CW1319 — Engineering & Mining Journal**
**330 W. 42nd St., New York 18, N. Y.**

## WANTED INDUSTRIAL PLANTS

Will arrange thru purchase of (1) capital stock, (2) Assets, (3) Machinery and equipment, whole or in part—Personnel usually retained, strict confidence. Box 1351 Church Street Station, New York 8, N. Y.

**BUYERS OF SURPLUS COPPER, INSULATED WIRES AND CABLES**

No lengths too long or too short.
Telephone: EAstgate 7-4778

**PIERCE CABLE CO.**
2674 Clybum Ave., Chicago 20, Ill.

### DIVIDEND NOTICE

**ANACONDA COPPER MINING CO.**
25 Broadway
New York 4, N. Y., July 24, 1952.
DIVIDEND NO. 177

The Board of Directors of Anaconda Copper Mining Company has declared a dividend of Seventy-five Cents (75c) per share on its capital stock of the par value of $50 per share, payable September 25, 1952, to stockholders of record at the close of business on August 26, 1952.

C. EARLE MORAN, Secretary & Treasurer.

# An Investment!

Productive advertising is an INVESTMENT rather than an EXPENDITURE.

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*Address Classified Advertising Division*

**ENGINEERING & MINING JOURNAL**

**330 W. 42d St., New York 36, N. Y.**

# MORSE DEPENDABLE RECONDITIONED MACHINERY

### LOCOMOTIVES

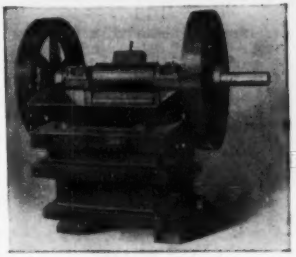
1—2½ ton Jeffrey, battery, 24" ga.
1— 4 ton Ironton, battery, 36" ga.
3— 6 ton Ironton, battery, 36" ga.
1— 6 ton Atlas, battery, 36" ga.
1—2½ ton Mancha battery, "Titan A" 24" ga. with 2 sets Edison batteries and charging set.
1—2-2½ ton Whitcomb battery, 24" gauge
2—7 ton G.E. permissible type battery, 36 gauge
2— 8 ton G.E. battery, 36" gauge
4—10 ton Atlas battery, 36" gauge
1— 3 ton Whitcomb gas engine driven, 24" gauge
1— 3 ton Ruth gas engine driven, 18" gauge
1— 6 ton Goodman trolley, 36" gauge
2—8 ton Goodman battery, 36" ga.
2—5 ton Mancha battery, 36" ga.
1—5 ton Jeffrey battery, 36" ga.
2—8 ton Goodman trolley, 36" ga.
1—5 ton Goodman trolley, 36" ga.

### FLOTATION MACHINES

1—6 Cell Stearns-Roger, 18".
1—NEW 6 Cell Morse JETAIR No. 30
1—NEW Morse Jetair #7 Hydro-cell
1—Fagregan Single Cell
1—6 Cell Denver #18 "Sub A"
2—6 Cell Denver #21 "Sub A"

### FILTERS

2—6' 2-disc American Filters
1—6' 3-disc American Filter
1—8'6" 8-disc Morse Filter
1—4' x 2" Dorrco Filter
1—4' x 6' Morse Drum Filter



### JAW CRUSHERS

1—12" x 18" Universal
1— 8" x 12" Universal
1— 9" x 15" Farrell
1— 9" x 16" Universal
1—10" x 16" Hendy
1— 8" x 24" Rogers
1— 8" x 36" Universal
1— 9" x 36" Cedar Rapids
1—24" x 13" Farrell
1—#2 Wheeling Crusher

### HOISTS—ELECTRIC

1— 10 HP Vulcan #0 Single Drum
1— 15 HP Morse New Single Drum
1— 20 HP HDB Single Drum
1— 22 HP Vulcan #1½ Single Drum
1— 30 HP Vulcan Single Drum
1— 3 HP Vulcan Double Drum
1— 3 HP Single Drum
2— 52 HP Vulcan #4½ Single Drum
1— 50 HP Fairbanks-Morse Single Drum
1— 60 HP HDB Single Drum
1— 60 HP Vulcan #23ELF Single Drum
2—150 HP Vulcan Single Drum
1—350 HP Dillon-Box Single Drum
1—600 HP Box Single Drum

### BALL & ROD MILLS

1—5' x 6' Marcy Ball Mill
1—4' x 4' Standard Ball Mill
2—6' x 48" Hardinge Conical Ball Mills with air swept equipment.
1—8' x 22" Hardinge Conical Pebble Mill.
1—3' x 8' Marcy Rod Mill

### MISCELLANEOUS EQUIPMENT

1—12" Dorr Lowhead Thickener arranged for mounting on 10' deep wooden tank.
1—15' Dorr Lowhead Thickener arranged for mounting on 12' deep wooden tank.
1—20" x 15' Dorr Duplex Rake Classifier.
3—Wilfley No. 6 Concentrating Tables.
1—24" x 15' Allis Chalmers single screw Log Washer.

## MORSE BROS. MACHINERY COMPANY

KNOWN THE WORLD OVER FOR DEPENDABLE MINING AND MILLING MACHINERY • ELECTRICAL, INDUSTRIAL, AND CONSTRUCTION EQUIPMENT

ESTABLISHED 1898 — DENVER 1, COLORADO, U.S.A. — (CABLE MORSE)

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1—500 Barrel Cement Plant
1—#1 Raymond Mill
Rotary Dryers 3' x 30'—4' x 30'—8' x 40'—5' x 50'—6½' x 60' & 7½' x 60'.
Tube & Ball Mills—6' x 9'—5' x 22'—5½' x 16'.
Fuller-Lehigh Mills—22"—47" & 52"—Bradley Mills.
Jaw Crushers—From 10" x 6" up to 38" x 24".
Crushing Rolls—From 12' x 24" up to 72" x 20".
1—Complete Linsl Hydrating Plant.
Sturtevant Rotary fine crushers—No. 0—No. 1—No. 1½ and No. 2.
Ring Roll Mills—Sturtevant No. 1—No. 2 duplex.
15'—18' & 18' Herreshoff furnaces.
Gyratory Crushers, No. 3 to No. 12.
5'—8'—10'—14' & 16' — Air separators
Magnetic separators—Jigs—screens—classifiers and thickeners
5', 6" & 7' dia. Rod Mills. Mine Hoists.
8' x 10'—8' x 12'—11½' x 19' Rotary Filters.
1—6' Raymond "Whizzer" Separator.
New Dryers and Kilns.

**W. P. HEINEKEN, INC.**
**50 Broad Street, New York**

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HL-20 LOADER
JOY (SULLIVAN) HL-20
3 TONS PER MINUTE
Guaranteed 95% New

**CENTRAL CONTRACTORS SERVICE, INC.**
**GEORGE A. CARLSON, Pres.**
1150 N. North Branch St. Chicago 22, Ill.

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STRIPPING SHOVEL FRONT 2 C.Y.
(30'6" Boom, 27'6" Square Stick)
OFF LORAIN 820
(Can be used on Lorain 79-80-82-820)
Used approximately 4 months — like new.
Complete including extra tubular dipper stick.
Replacement price approx. $15,000.
SACRIFICE $7,500
CHEMICO COMPANY
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1 – 1500 H.P.
Bought and Sold
New and Rebuilt
ELECTRIC EQUIPMENT CO.
ROCHESTER 1, N. Y.

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# SACRIFICE SALE!

**$3,000,000 Valuation**

## MINING MACHINERY

and

## EQUIPMENT

(40) MINE HOISTS
(20) MINING MACHINES
(23) SHAKER CONVEYORS
(8) JOY LOADERS, SHUTTLE CARS
(2) CARDOX CHARGING PLANTS
(3) ROTARY CONVERTERS
(2) 625 KVA-C.E. GENERATORS
(Curtis Steam Turbines)
(7) 100 TON RAILROAD SCALES
(450) PIT CARS
(750) TONS 20#, 40#, 80# RAIL
Tipples—tipple equipment — pumps — blowers—Electrical Equipment — Pipe—Steel Buildings — Machine Tools—Supplies, etc., etc.
Former property of
Victor American Fuel Co.
Mt. Harris, Colorado

**EVERYTHING MUST BE SOLD IMMEDIATELY!**

Piece by piece, or in lots to suit your requirements.
For complete listing and information

**CALL—WIRE—WRITE**
**MR. JOE BERMAN**
Liquidator in charge of sales
**P. O. BOX 124**
**MT. HARRIS, COLORADO**
**Tel. Hayden 29R3**

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### 28 SURPLUS NEW BELT CONVEYORS

30 INCH 1-136' — 1-270' — 2-350' — 1-418'
2-500' — 1-1100' & 2-1500' Long.
36 INCH 1-160' — 2-250' — 1-320' — 1-400'
1-590' — 2-1000' & 1-1600' Long.
42 INCH 1-144' — 1-290' — 1-377' — 1-575'
2-700' — 1-800' & 2-1500' Long.

### 3 SURPLUS NEW VIBRATING SCREENS

Allis Chalmers 6'x14'—2 Deck Rypl-Flo

### 10 SURPLUS MERRICK E WEIGHTOMETERS

1 for 24 In. 8 for 30 or 36 In.

1 for 42 In. Belt.

### 1 NEW SURPLUS DORR RAKE CLASSIFIER

1—DORR 7' x 30' MODEL DSFX

AIR COMPRESSORS
9 Electric 5,000, 3,065, 3,178, 2,200, 1,578 & 1,302
1,000, 678 & 500 Ft.
6 Diesel 1,578, 1,000, 678 & 500 Ft.

LOCOMOTIVES AND CRANES
12 Diesel 100, 80, 65, 45, 30, 20 Ton Locomotives.
22 Gas, 35, 25, 18, 12, 8 & 6 Ton Locomotives.
30 Ton Orton Diesel Locomotive Crane.

R. R. CARS
100 Dump Cars, 2, 4, 12, 20 and 30 Yd.
100—60 Ton Flat Cars. 66—50-Ton Gondolas.
150—8,000 & 10,000 Gal. Cap. Tank Cars

TUNNEL MUCKERS—LOADERS
4 Gardner Denver GD9 & GD14.
10 Elmco 12B & 21, 4 Sullivan HL20.

LARGE JAW CRUSHERS
7—60x84", 40x48", 36x42", 24x36" & 28x36".

ROTARY DRYERS AND KILNS
4'x20', 4'x45', 6'x33' & 7'x28'
Single and Double Shell.
Kilns, 6' x 60', 4'x45', 9'x170' & 5½'x7'x60'.

BALL, ROD & TUBE MILLS & CLASSIFIERS
2—5'x22' A.C. Tube Mills
4½'x16', 5'x22', 6'x22', 8'x22' & 10'x36" Hardinge Conical Ball Mills.
6'x6', 6'x10' & 7'x6' Cylindrical Ball Mills.
8', 10' & 16' Mechanical Air Separators.
36" & 60" Spiral and 6x20 Dorr Rake Classifier.
5'x12', 5'x14' & 8'x12' Rod Mills, Marcy, Hardinge.
18"—4 stage Rowand Wetherell Magnetic Separator.
Dings 1-R-3-60" Rolls, Mag. Separator.
200, 400 & 500 HP—Double Drum Mine Hoists.
75, 300, 450, 500 & 600 HP Single Drums.

STEEL STORAGE TANKS
40—10,000 Gal. R. R. Car Tanks.

PULVERIZERS
Hercules Jr. & #1 & 2 Ring Roll.

STANHOPE, 60 E. 42nd St., New York 17, N. Y.

# USED AND REBUILT MACHINERY

### CRUSHERS

1—2' Symons Std. Cone w/30 H.P. Motor
1—2'-4" Traylor TY, w/75 H.P. Motor
1—1'-8" Traylor TY, w/motor
1—10"x20" Pacific Jaw w/25 H.P. Motor
1—10"x24" Denver w/30 H.P. Motor
1—15"x36" Universal w/75 H.P. Motor
1—10"x16" Gruendler Ball Bearing w/15 H.P. TEFC Motor.

### FEEDERS

1—26" x 11' armored belt, with 1 H.P. Gearmotor
4—30" x 5½" reciprocating plate type Link Belt, 3 H.P. Gearmotors
1—Ross Chain Type, 1½ H.P. Varispeed Gearmotor
1—30" x 3' S. A. Co. Belt Feeder, 1½ H.P. Varispeed Gearmotor

### FILTERS

1—4'—3 leaf Eimco with accessories

### FLOTATION

1—6-cell Denver Sub-A #18 w/motors
1—5-cell Fagergren, 36" x 36" w/motors
1—6-cell Union Iron Works, 32" x 32"

### JIGS

1—Pan American Duplex 42" x 42" Placer type with 2 H.P. Gearmotor
1—8" x 12" Denver Duplex (almost new)
1—8" x 12" Denver Simplex
1—16" x 24" Denver Duplex

### BALL AND ROD MILLS

1—6' x 6' Joshua Hendy, complete
1—6' x 22" Hardinge
1—5' x 10' Stearns-Roger Rod Mill w/100 H.P. Motor, automatic starting equipment
1—7' x 8' Traylor Ball Mill
1—7' x 36" Hardinge

### SAND PUMPS

1—2" Wilfley w/10 H.P. Motor
1—4" Wemco — 25 H.P. Motor
2—8" Wilfley w/50 H.P. Motors

### TABLES

1—Wilfley half-size
1—Deister 6' x 14'

### THICKENERS

2—40' x 10' Denver, steel tanks
3—40' x 10' Eimco, steel tanks
1—18' x 10' Denver, wood tank

**ALSO COMPLETE ASSAY EQUIPMENT, MINE HOISTS, RAIL, ETC.**
**PLUS COMPLETE 50-TON GRAVITY FLOTATION MILL**
***Write for complete inventory and photographs***

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808 Newhouse Bulding
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Salt Lake City, Utah
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## LIME REBURNER PLANT
### Staten Island, N. Y.

1—VULCAN Rotary Kiln 7' x 120' complete with 4 speed motor, Bucket Conveyors and all auxiliary equipment.
1—Steel Stack 5' x 125'.
2—Oliver Rotary Steel Filters with monel filter cloth, 5'3" x 6' with all auxiliary equipment.
1—Nash HyTor Vacuum Pump, Size H-9. Complete with motor.
2—Swenson Triple Effect Evaporators complete with auxiliary equipment.
1—Zaremba Triple Effect Evaporator with auxiliary equipment.

All inquiries direct to—

**R. Gelb & Sons, Inc.**
State Highway No. 29 Union, N. J.
Unionville 2-4900

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**COMPRESSORS**
***NEW AND REBUILT***
SINCE 1902
STATIONARY OR PORTABLE
FOR REBUILDING AT ITS FINEST
TRY AMERICAN
RENT—SELL—BUY

All Makes — All Sizes
Gas—Steam—Diesel—Electric
SALE OR RENT

GUARANTEED PERFORMANCE

RENTAL
273 AIR COMPRESSORS AVAILABLE
RENTAL PURCHASE
GAS — DIESEL — ELECTRIC

**AMERICAN AIR COMPRESSOR CORP.**
Dell Ave., & 47th, North Bergen, N. J.

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CHAIN O MINES, INC.,
228 So. Wabash Ave., Chicago 4, Ill.
FOR SALE—Aerial tramway 3300 ft. 36—1100 lb. buckets good condition.
NEED diesel trucks or will contract 1,000,000 tons haul Mill TAILS 4,000 ft. Want rod & ball mills, vib-screens, good zinc-float plant — large tanks and culverts. Large low grade ore bodies any metal—anywhere. Describe and send small sample.

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**FOR SALE**
Excellent Condition
Hardinge 10' x 36" Ball Mill (300 H.P. Motor)
Hardinge #126 Loop Classifier
(100 H.P. Motor with Fan)
60 Tons Forged Steel Balls
Inspection Invited
**MANGANESE, INC.**
Box 2008, Henderson, Nevada

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SALE — RENT
GUARANTEED LIKE NEW
**1949 LORAIN 820 2 C.Y.**
HI-FRONT SHOVEL, CRANE, DRAG
CHEMICAL CO.
145 W. 63 St., N.Y.C. MU 5-6826

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**FOR SALE**
**60 HP prime**
**DIESEL ENGINE**
Made by Power Mfg. Co., type J, speed 277 RPM.
**The Asbury Graphite Mills, Inc.**
Asbury, N. J.

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Plymouth, gasoline; air brakes, standard guage; excellent condition, reasonable. Guage can be changed. Spare parts.
**General Machinery & Equipment Co., Inc.**
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Tel. Victor 0018 & 19

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BATTERY AND LIGHT EQUIPMENT — USED.
100 Type G.W. Wheat Electric Mine Lamp and batteries.
1 Assembly 2-51 place Model 508 battery charging rack with 2 units of Model 50 Wheat Charging Apparatus 230 v. 60 cy. 1 amp.
1 5 place Wheat charging set.
1 6 place Wheat charging set.
TOTAL PRICE . $1,000.00 F.O.B. Santa Ana, Calif.
Lippincott Lead Company, 606 Terminal Street
P.O. Box 1811—KI-3-8221—Santa Ana, California

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FOR SALE — ONE NEW NUMBER 4 MACE SMELTING FURNACE SUITABLE FOR COPPER AND LEAD ORES ETC. AT CONSIDERABLE PRICE REDUCTION. PAYMENT IN DOLLARS OR STERLING.
FS 4644 Engineering & Mining Journal
330 W. 42nd Street New York 36, N.Y.

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**FOR SALE**
**ONE NEW MACE NO. 2**
**BLAST FURNACE**
complete with slag pots, etc.
Price $5,000 cash — F.O.B. Mine.
FS-4890, Engineering & Mining Jrl.,
330 West 42nd St., New York 36, N. Y.

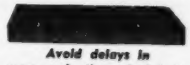
CARLYLE
INDUSTRIAL RUBBER PRODUCTS FOR EVERY PURPOSE

IMMEDIATE DELIVERY OF CONVEYOR, ELEVATOR AND TRANSMISSION BELTING — FIRE, WATER, SUCTION, AIR, STEAM AND WELL HOSE

*WHY WAIT*

**We have 8 to 48 RUBBER CONVEYOR BELTING**

**TOUGH COVERS**—Heavy duty, specially compounded abrasive resistant rubber covers having high tensile strength. Thoroughly capable of withstanding the abrasive action of bulk materials. Properly vulcanized to the carcass to assure utmost performance, economically.
**STRONG CARCASS**—Constructed of finest quality 28 and 32 ounce tough cotton duck, properly treated and impregnated to avoid mildew from moisture and atmospheric conditions. Each ply thoroughly embedded in rubber to prevent ply separation.
**FLEXIBILITY** — Careful attention has been given in the construction of all belts to have the proper flexibility assuring the following desirable features: troughs easily, runs true on all idlers, gouge resistant, excellent for long and short hauls and slope installations.



*Avoid delays in your production schedules!*

We carry in stock for your immediate requirements, Conveyor Belting in widths from 8 inches to 48 inches

| Width | Ply | Thickness Top Cover | Thickness Bottom Cover | Type of Duck Carcass |
|---|---|---|---|---|
| 8" | 4 | 1/16" | 1/32" | 28 Oz. |
| 10" | 4 | 1/16" | 1/32" | 28 Oz. |
| 12" | 4 | 1/16" | 1/32" | 28 Oz. |
| 14" | 4 | 1/16" | 1/32" | 28 Oz. |
| 16" | 4 | 1/8" | 1/32" | 28 Oz. |
| 18" | 4 | 1/8" | 1/32" | 28 Oz. |
| 20" | 4 | 1/8" | 1/32" | 28 Oz. |
| 20" | 5 | 1/8" | 1/32" | 28 Oz. |
| 24" | 4 | 1/8" | 1/32" | 28 Oz. |
| 24" | 5 | 1/8" | 1/32" | 28 Oz. |
| 26" | 5 | 1/8" | 1/32" | 28 Oz. |
| 30" | 4 | 1/8" | 1/16" | 32 Oz. |
| 30" | 5 | 1/8" | 1/16" | 32 Oz. |
| 30" | 6 | 1/8" | 1/16" | 32 Oz. |
| 36" | 6 | 1/8" | 1/16" | 32 Oz. |
| 42" | 5 | 1/8" | 1/16" | 32 Oz. |
| 48" | 5 | 1/8" | 1/16" | 32 Oz. |
| 48" | 8 | 1/8" | 1/16" | 32 Oz. |

INQUIRE FOR SIZES NOT LISTED. ELEVATOR TRANSMISSION & V-BELTING ALSO IN STOCK.

*All our belting made by the leading belting manufacturers.*

Write for Free Booklet on Installation, Care & Maintenance of Conveyer Belting.

SEND US YOUR INQUIRIES FOR OTHER RUBBER PRODUCTS

CARLYLE RUBBER CO., Inc.
62-66 Park Place, New York 7, N. Y.
Phone: Digby 9-3810



**FLOT MACHINES**
1—2-cell #15 Denver "Sub-A" Flot Wood Tank
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**PUMPS — SAND**
1—2" Wilfley with 5 HP AC Motor
1—3" Wilfley with 10 HP AC Motor

**HOISTS — AIR**
1—5 HP Sullivan Turbinair 2-drum Slusher Hoist with scraper bucket
1—Leadville Sgl. Drum, 1000# rope pull

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1—6 x 12 Wheeling
1—10 x 20 Allis-Chalmers, Blake Type
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1—18" x 35' Long, complete with belt and motor
1—14" x 11' Long, Belt Feeder, on steel channels

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1—30" x 48" Baker

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1—32" x 16" Davis Crushing Roll
1—3200' Aerial Tram
1—750' Jig-back Tram
1—Jeffrey Dry Reagent Feeder, Vib. Type
1—18" Denver Cone Type Dry Reagent Feeder
1—12" Jeffrey Blower Fan
1—50 Ton Maurer Truck Scale, steel I Beam Stringers
1—#24A Humphrey Spiral with rack
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Enclosed Safety Switches, 30 to 200 amp.
1—30" x 8' Air Receiver
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**FILTER:** Oliver 14 x 16', drum type, complete.
**MINE HOISTS:** 1—Vulcan single drum 3' dia., 2'9" face, 75 H.P., 220 volt, NEW condition. 1—150 H.P., 6'6" dia., 6'8" face. 1—Vulcan double drum, 8' dia., 4' face, one clutched, 200 H.P. motor. 1—250 H.P., 72" dia., 48" face. All 3 phase, 60 cycle, 2200 volt with control equipment. Head frame for double shaft 16'9" x 17'2", height 55 ft. with or without 8 ft. dia. sheaves for 1⅛" rope. 1—950 H.P. double drums, 14' dia., 6'10" face, 1⅜" rope, 1500 FPM, complete with motor and controls. Other hoists 100 H.P. to 1050 H.P., single and double drum with electrical equipment.
**COMPRESSORS:** Worthington DC2, 29/18-1/2 x 21, motor 600 H.P. synchronous, 440 volt, with all auxiliary equipment. 2—Ingersoll Rand Model XVH, 200 H.P., 2200 volt, complete, NEW condition.
**MOTORS:** 2—NEW G.E., Tri-clad, drip proof, 1000 H.P., 1800 RPM, 2300 volt, with automatic controls.
**CRUSHERS, JAW:** Sizes 12" x 15" to 48" x 60".
**CRUSHER, ROLL:** Traylor 18 x 42", heavy duty.
**CRUSHER, GYRATORY:** Telsmith 18-B, all steel, opening 16 x 74", 75 H.P. motor, V-belt.
**CRUSHERS, REDUCTION:** Symons 3 ft., 4 ft. and 5½ ft. with short head and flat bowl, with motor and drive. Symons 2 ft. with coarse bowl. Telsmith 13" and one 16" with motors and drives.
**DRYERS or KILNS:** 2—10 ft. x 90 ft. heavy duty, with or without auxiliary equipment, condition like NEW. Located Minnesota. 1—10 ft. x 25 ft. and 1—5 ft. x 50 ft.
**CLASSIFIERS:** 2—Akins 54" double pitch, single screw, worm type, 3 H.P. synero-gear motor, 220/440 volt, lifting device 1½ H.P. 2—Akins and Wemco 72" double pitch, single screw, worm type, 7½ H.P. motors, 220/440 volt, speed reducer and lifting device. Three of above located near Reno, Nevada.
1—Dorr 8 ft. x 33 ft. rake, 22 ft. dia. bowl, with motor and drive. New 1951, slightly used.
**PULVERIZERS:** One Marcy Rod Mill 5' x 12' and one 5' x 14' manganese lined, with motors and drive. Hardinge Mill 5' x 22" manganese lined for dry grinding, complete with 30 H.P. motor, 220/440 volt, and feeder.
**APRON FEEDERS:** 48" x 18 ft., heavy duty.
**BOOT BUCKET ELEVATORS:** Buckets size 12" x 7" on chain, 23 ft., 40 ft. and 48 ft., with motors and drives.

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**Lansdowne, Pa.**
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1—36" dia. 1-drum Vulcan with post brake, and 75 hp 440-v motor.

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39 W. Adams St. — — Phoenix, Arizona

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A-3675

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